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AN EXAMINATION OF THE EFFECTS OF A QUALITY CIRCLES PROGRAM ON ATTITUDINAL VARIABLES IN TWO DOD INSTALLATIONS

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DEPARTMENT OF THE AIR FORCE
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Wright-Patterson Air Force Base, Ohio

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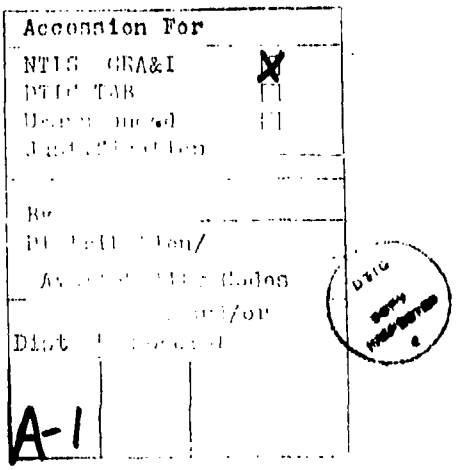

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One of the most popular organizational development techniques today is Quality Circles (QC). A quality circle is a small group of volunteers with special training who meet regularly to identify, analyze, and solve problems, and implement solutions. QCs were developed in Japan in the 1960's and were imported to the U.S. in the 1970's. QCs require structure and training in problem-solving techniques. Studies have been conducted to evaluate QC effects on productivity and attitudes. Since QC involvement is believed to affect attitudes, the causal relationships between QCs and the following factors are examined: cohesiveness, task characteristics, satisfaction, commitment, participation, and perceptions of work group and supervisor performance. Research data were collected at two DOD installations, verified for reliability, tested for correlation via the Pearson correlation and multiple regression statistical techniques. Group means were compared for QC and control group posttests and QC pretest and posttest. Results revealed no significant attitudinal differences between the groups. Specific recommendations for the successful implementation of a QC program include assessing the organizational climate for readiness, management support and commitment, slow change and stable leadership, and adherence to QC principles. Finally, managers should have realistic expectations and allow QCs time to work.

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AN EXAMINATION OF THE EFFECTS OF A QUALITY CIRCLES PROGRAM ON ATTITUDINAL VARIABLES IN TWO DOD INSTALLATIONS

A Thesis

Presented to the Faculty of the School of Systems and Logistics

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In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Logistics Management

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CHAPTER 1

INTRODUCTION

Overview

One of the most popular organizational development techniques available today is Quality Circles (QC). A quality circle is a small group of volunteers who, after receiving specialized training, meet regularly to identify problems, analyze these problems, develop solutions, and upon management approval implement the solutions whenever feasible (Lloyd & Rehg, 1982). Gryna (1981) divides benefits of circles into two broad categories: the improvement of the attitudes and behavior of workers, and measurable savings. Nelson (1980) cites testimonials to their financial success:

- An estimated $636,000 saved by the purchasing department of Westinghouse Electronics Systems Center, Baltimore, Maryland, due to overshipments by vendors now being returned at vendors' expense. This change was suggested by quality circle members.

- Approximately 130 circles at Honeywell, St. Petersburg, Florida, helped reduce product costs by over $500,000.

- After a circle of machinists at Lockheed installed travel-dial indicators on four machine tools, product

quality and machine efficiency improved by 20 percent over four months. This idea saved $3,000 per year.

- Quality circles at Westinghouse developed a materials identification chart which enabled Inductive Components Department assemblers to avoid leaving their work place to verify process specifications, saving up to $14,000 yearly (Nelson, 1980).

Higher level management often requires dollar savings as justification for implementing QCs. However, as both objective and attitudinal measures are important, management should consider positive effects on attitudes and/or communication as well as financial benefits as justification for the expense of implementing QCs. In fact, upper management at Pentel (an American subsidiary of a Japanese Company) has no plans to make a comparison of the cost and savings from circle activities; they feel that the positive effect that circles have in improving communication is enough (Gryna, 1981).

Problem Statement

Much time and money are spent searching for ways to increase the productivity of an organization. The Quality Circles process is one technique which management sometimes considers and then implements without having any idea whether the effort will be cost effective. Rigorous evaluation is needed to learn more about the QC process and to provide information to organizational decision makers so they may make

rational decisions regarding QC programs. There have been no truly rigorous studies involving cost savings or perceptual data reported in the literature.

CHAPTER 2

LITERATURE REVIEW

Introduction

A quality (control) circle is a human resource development process which involves a relatively autonomous small group led by a foreman (Mento, 1982). A quality circle effort may result in: improved morale; an increased sense of loyalty to the organization; a sense of teamwork among members who participate; improved overall productivity of the organization; improved quality of the product or services; a reduced number of grievances, absenteeism, and tardiness; and the solution of problems which save the organization money (Thompson, 1982).

Managers play a crucial role in the implementation and effectiveness of a quality circles program. Active management support and involvement are fundamental ingredients for success (Sikes, Connell, & Donovan, 1980).

History and Early Development of Quality Circles in Japan

The quality circles concept evolved in Japan as a combination of U.S. statistical quality control practices and Japanese innovations. Following World War II, Japan's industrial leaders realized that the future of their country was partly dependent on an economy which produced competitive

goods (Gryna, 1981). Japan then undertook to revolutionize their product quality to make their goods more saleable in the world market (Juran, 1978; Metz, 1981).

The lead role in developing the quality circle concept was played by the Union of Japanese Scientists and Engineers (JUSE), a powerful trade organization. The JUSE organized a quality control research group in 1949 (Gryna, 1981). In 1950, they invited American statisticians, notably Dr. W. Edwards Deming, to Japan to teach a seminar on American industrial standards to Japanese engineers and statisticians (Cole, 1980b; Metz, 1981). Dr. Deming provided training in statistical techniques that could be used to identify problems of quality and productivity (Ouchi, 1981). Following Dr. Deming's lectures on statistical quality control procedures, the JUSE research group began developing its own quality control methods (Nakazato, 1976). These techniques comprised some of the underlying analytical tools used by quality circles (Ouchi, 1981). In 1954, the JUSE invited the noted American quality control expert, Dr. Joseph M. Juran, to give a series of lectures in Japan (Ouchi, 1981). Dr. Juran emphasized that quality control had to become an integral part of the management function and practiced throughout an organization (Cole, 1980b).

Massive training programs were begun (Juran, 1980) and from 1955 to 1960 everyone from top to rank-and-file employees received exposure to statistical quality control knowledge and techniques (Cole, 1980b). To train the large

number of foremen throughout the country the Japanese used an unusual approach - a training course was broadcast on national radio and copies of the broadcast text were sold at newsstands (Gryna, 1981). The Japanese Union of Scientists and Engineers published a new journal, QC for the Foreman, in 1962 which encouraged foremen to enlist the aid of their workers in solving problems (Gryna, 1981). With the formation of study groups, quality control responsibility shifted from a minority of engineers with limited shop experience to the responsibility of each employee (Cole, 1980b). When the groups met, the workers were seated around a table for the purpose of improving the quality of their products (Gryna, 1981). Thus the beginning of the quality (control) circle concept.

The Japanese QC program incorporated two ideas: statistical quality control and diffused responsibility for decision-making throughout an organization (Wood, Hall, & Azumi, 1982; Ouchi, 1981). The Japanese recognized that training and participative decision-making go hand in hand. Without training, the invitation to participate in decision-making will prove frustrating. Conversely, without shared decision-making, problem-solving training will be wasted. Full potential of workers can only be realized when training and decision-making are blended (Ouchi, 1981).

The first quality circle in Japan was begun in 1962. Today, there are over 100,000 QCs registered with the JUSE and an additional 1 million unregistered QCs (Ouchi, 1981).

Japanese companies with the longest involvement in the quality circle technique include Toyota, Nissan, Pentel, and Sony (Mento, 1982).

U.S. Experiences With Quality Circles

In the early 1970's, U.S. high technology aerospace companies were extensively involved with Japanese manufacturers and could see quality circles in action (Mento, 1982). In 1974, Lockheed Missile and Space Company was the first U.S. company to implement QCs. Several reasons for the early development of QCs in high technology and aerospace companies have been suggested by Cole (1979): there was already an emphasis on product quality, labor-management cooperation was well-founded, the amount of group work was considerable, and many of the components made were unique, thereby allowing groups to develop their own work routine.

The QC concept received increasing emphasis and attention following the 1980 drop in U.S. automobile sales which was thought to be partially caused by Japanese competition producing a higher quality product (Yager, 1980). Japan's economic success in penetrating the Western markets was an impetus to the American interest in quality circles (Cole, 1980b).

While Lockheed's efforts have since declined, the spread of QC programs throughout American industry is unparalleled by any other organizational improvement program (Blair, Cohen, & Hurwitz, 1982). Presently, QCs are

especially notable at Westinghouse, General Motors, Honeywell, Ford Motor Company, the U.S. Air Force, and U.S. Navy (Mento, 1982).

Structure

Dewar (1979) describes a quality circle as an integrated system composed of the following levels of participation: circle members, a circle leader (foreman), facilitator (program coordinator), and a steering committee.

The size of each circle is generally limited to between three and fifteen, preferably in the region of five to ten (Lloyd & Rehg, 1982). Ideally the circle members are individuals from the same work area, or who do similar work, so that the problems they select will be familiar to all of them (Dewar, 1979). They receive special training in the rules of quality circle participation, techniques of problem-solving and making management presentations (Whitehead & Blair, 1982).

The circle has a greater chance of success when the leader is a supervisor. Responsibility for the smooth and effective operation of the QC rests with the circle leader. Leaders vary in the amount of support they require from the facilitator but the support should continue to diminish. The leader should endeavor to involve each member as many times as possible at every meeting through questions and seeking opinions (Dewar, 1979).

The individual responsible for coordinating and directing QC activities within an organization is the

facilitator. He should feel as comfortable talking to the president of the company as to entry level clerical or factory employees. His duties include training circle leaders, forming a link between the circles and the rest of the organization, and working closely with the steering committee (Dewar, 1979).

Representatives (managers or top level staff people) from major departments within the company as well as the facilitator should be members of the steering committee. A representative of the union, if there is one, is also desirable. Involvement and participation in the steering committee meetings is as important as participation at the circle level. The size is ideally seven or eight individuals but it should not exceed fifteen. Meetings should be presided over by a chairman or decisions reached by a democratic process - one man, one vote. Duties include: setting goals and objectives for QC activities, establishing operational guidelines, and controlling the rate of expansion (Dewar, 1979).

Everyone in a shop or office has the opportunity to join, to refuse to join, to postpone joining, to quit, and to rejoin (Thompson, 1982). Members in the group seek to improve working conditions, reduce costs, increase productivity (Cole, 1980b), and improve product quality (Metz, 1981). Meetings are usually held weekly, on company time with pay, and in special rooms removed from the normal work area (Thompson, 1982). After selecting a problem and

developing a solution, the findings are presented to management along with the circle's assessment of the cost and benefits (Whitehead & Blair, 1982). Management then accepts, rejects, or suggests modifications to the proposal. Implementation of solutions is often a joint effort between management and the circle. The process then begins again with the selection of another problem.

Circles exist as long as the members wish to meet. They can declare themselves inactive; they can reactivate themselves at a later date; or they may exist for only one or two months, or for years, solving hundreds of problems, or only one or two (Thompson, 1982).

Training

One of the key elements in the quality circle structure is training for both the leaders and circle members. Training for circle leaders is to show them how to function as coach, coordinator, and trainer in the quality circle. Tools for problem-solving and presentation techniques are given to circle members (Gryna, 1981). Training areas include:

1. Group dynamics: Many managers agree in today's environment that effective managing requires extensive use of groups. The idea of a group implies some degree of interdependence, mutual influence, and interaction among people. Attitudes toward the company and overall work performance can be influenced by the immediate work group (Albanese, 1981).

Because of the importance of group agreement to solutions of problems discussed, the leader is trained to conduct circle meetings so that decisions are made more by consensus than by a majority vote (Gryna, 1981).

2. Motivation: The quality of an individual's performance involves his or her motivation. Motivation is influenced by the organization, the leader, the group, the reward system, and the individual's attitudes, skills, and effort expended (Szilagyi & Wallace, 1980). The importance of communication in leadership and the concept of an individual's motivation are emphasized. In motivation training the leaders are shown how quality circles can contribute to self-motivation, leadership, and communication. Several barriers to communication are described and applied to conducting problem-solving discussions in circle meetings (Gryna, 1981).

3. Problem solving: Circle members are usually trained by the circle leader, although sometimes the facilitator may perform this function (Gryna, 1981). A typical program includes training in the following techniques:

a. Brainstorming - The purpose of brainstorming is to bring everyone's ideas out into the open in order to generate a list of potential projects for the circle. No evaluation is permitted during brainstorming and since there are no restraints a large number of ideas on a problem is generated by the members (Gryna, 1981). Wild ideas are safe to offer since neither criticism nor ridicule are permitted.

These original ideas which are all recorded for later analysis create enthusiasm (Dewar, 1979).

b. Cause-and-effect diagram - This is also known as a fishbone or Ishikawa diagram. It is a graphic way of stating the symptom of a problem (effect) and then listing the possible reasons (causes) for the problem (Gryna, 1981). The diagram is constructed while the problem is being brainstormed and it is later analyzed to identify the most likely cause.

c. Data gathering (sampling) - The major functions of quality circles are to analyze and solve problems. In order to accomplish this, circle members receive training in data gathering techniques. Check sheets are often used for convenience and as an economical way of collecting data (Dewar, 1979). Training techniques in data gathering and sampling are used to assure accuracy and to save time.

d. Histogram - This is a vertical bar chart which shows the distribution of data in terms of the frequency of occurrence of specific data (Gryna, 1981). Circle members are taught to interpret the meaning of various shaped histograms (Dewar, 1979).

e. Pareto diagram - This technique is a graphic way of summarizing data in order to highlight the main contributors to some overall result (Gryna, 1981). Each column on the chart depicts a problem and the diagram portrays the problems in descending order of importance. The tallest

column is always to the left and is the problem which will be solved first because it is the most important (Dewar, 1979).

4. Presentation: Since circles use a presentation setting to make recommendations or provide status to their manager, members are given training in the basics of public speaking and the fundamentals of preparing and using graphs and charts (Dewar, 1979).

Comparison of Quality Circles and Other Organizational Development Techniques

Quality circle member involvement in identifying and solving problems is a form of participative management. Most forms of participative management allow workers to provide input to a planning process or to review plans already developed but QCs go further since they encourage workers to identify problems, solve them, and then implement their solutions. In this way workers take the initiative in decision-making rather than just reacting to management's proposals (Gryna, 1981). The following discussion compares the principles of QCs to other organizational development (OD) programs.

1. Voluntary participation. Most motivational schemes are characterized by volunteerism but the Zero Defects (ZD) program includes the "voluntary" signing of ZD pledge cards (Juran, 1967).

2. Basic assumption. QCs begin with the assumption that the causes of poor performance are not known and there

is a need for analysis to discover what actually causes the poor performance. Other programs, except the Scanlon Plan, assume that the work force could do better but is holding back for no good reason. The basic principle of the Scanlon Plan is that the work force is a "reservoir of creativity and experience that, if properly tapped, has the potential to greatly increase productivity" (White, 1979).

3. Training. Quality circles are unique in the training aspect but this is consistent with the belief that the causes of poor performance are not really known. Other OD techniques involve the attitude that the work force "can but won't" and therefore see no need for analysis and training since the cause is already known.

4. Group analysis. Motivational plans, except for QCs and the Scanlon Plan (which uses joint committees for improving productivity), depend on individual input. All plans provide for self-analysis but for the most part the analysis is left to someone else, e.g., a suggestion form is dropped into a box.

5. Reward. The type of reward varies according to the program used. Quality circle emphasis is mostly on non-financial rewards with goals of company and self improvement, the ZD program stresses the pride of workmanship, and piecework and suggestion systems rely on money incentives.

Parallel organization intervention is an OD strategy which appears to rely on the same basic principles of involving workers in the decision-making process as quality

circles do (Blair & Hurwitz, 1981). They both establish problem-solving structures and involve lower level employee participation. This enables both the employee and organization to benefit and improve communication between upper and lower levels of the organization occurs as a result. The parallel organization involves the formation of several task groups and a steering committee. These groups differ from quality circles in that they are composed of employees from different levels who work as equals. The steering committee coordinates and sets the agenda for the task groups. The parallel organization also differs in the type of problems discussed. QC problems relate to productivity whereas the parallel organization addresses any organization problems. Training is an integral part of QCs but not an important part of the parallel organization. One other main difference is the rotating membership in the parallel organization so that more members may participate rather than increasing the numbers of groups as practiced by QCs (Blair & Hurwitz, 1981).

Possible Mechanisms Why Quality Circles are Related to Productivity and Attitudes

QCs are related to productivity and attitudes in a number of ways (Wood et al., 1982). The QC approach moves the center of expertise from management to workers (Whitehead & Blair, 1982). Under the concept, workers are recognized as being capable of identifying and solving problems. Allowing workers to contribute to problem-solving in an

organization may lead to improved attitudes and productivity (Whitehead & Blair, 1982). Since both the problem and its solution come from the work group itself, motivation to participate is enhanced. Members receive reinforcement when a successful solution is developed and implemented (Whitehead & Blair, 1982; Wood et al., 1982). In addition, positive feelings of morale are increased through recognition from management when successes are publicized. The problem-solving ideas may themselves be directly related to methods of increasing productivity (Novelli & Mohrman, 1982). Besides increasing productivity, the implementation of the circle's ideas provides feelings of achievement and involvement to the members (Novelli & Mohrman, 1982).

QCs also involve a shift from external control (by management) to self-control by the group (Whitehead & Blair, 1982). When given the opportunity and training, groups will exercise self-control responsibly. According to Whitehead and Blair (1982), QCs are consistent with theory and research on small group effectiveness. Group cohesion is encouraged and strengthened through team-building exercises, limited group size, and choosing homogeneous membership. The group attains status through its output of problem-solving ideas and productivity, which in turn reinforces cohesiveness and capacity for self-control (Whitehead & Blair, 1982).

Training in problem-solving methodology raises individuals' feelings of competence and helps minimize errors in diagnosing problem areas (Wood et al., 1982). Productivity

and attitudes are impacted by this increase in problem-solving skills and knowledge of workers and supervisors (Novelli & Mohrman, 1982).

An improvement in attitudes may be related to the degree of involvement in the circle; those members who participate fully can expect to improve attitudes the most (Novelli & Mohrman, 1982). QCs provide for motivation potential (Whitehead & Blair, 1982). Because participation is voluntary, individuals with low motivation can exclude themselves. QC members are more motivated because problems and solutions are chosen and developed within the group. QCs also provide a mechanism for workers to communicate with managers through group presentations of problem-solving ideas (Wood et al., 1982). Integrating QCs into existing organizational structure should reduce conflict and improve communications (Whitehead & Blair, 1982).

Descriptions of variables related to QCs generally include task identity, task significance, high skill variety, autonomy, and feedback, all of which are believed related to job enrichment. Job enrichment, through the QC program, should lead to higher productivity and job satisfaction (Wood et al., 1982).

Quality Circles Evaluation Attempts

Donovan and Van Horn (1980) Study at Honeywell. Donovan and Van Horn conducted five case studies at Honeywell involving from one to twelve circles over periods of six months

to two years. They emphasize that management must be able to assess their QC program's effect on productivity and job satisfaction. Tc systematically evaluate the QC program requires measurement of cost savings and worker attitudes, reliable research tools, and good research designs.

A cost to savings comparison was made which included measures of productivity and quality (hours/unit, defects per unit) and also program costs (training and meeting time). To evaluate worker attitude changes, Donovan and Van Horn developed the Job Reaction Survey. The survey included variables which are believed to be related to job satisfaction and productivity. These are: cooperation, communication, management responsiveness, use of job knowledge, role clarity, participation, feedback, task significance, and recognition.

Donovan and Van Horn used the pre-post design in five case studies with and without control groups. Two cases were of pre-post design without control groups. One involved the electronics assembly of guidance systems. Ten circles were organized in an environment of complex technology and low volume. Assembly cost per unit was the measure and the circles reduced costs by 46% over the two-year longitudinal study. However, there may have been other factors influencing the cost reduction such as decreased material costs or improved operations.

Another case study without control groups was made of 11 circles in the Hybrid Micro Electronics Lab, a rapidly changing technology environment. Measures included assembly

cost per unit, cost savings per suggestion, and the Job Reaction Survey. The time interval was from three months prior to starting circles and nine months after circle implementation. Results showed 109 problems were solved and implemented with a documented savings of $86,430. Assembly costs per unit decreased by 36 percent. Results of the Job Reaction Survey revealed significant improvement in seven of the variables: cooperation, management response, communication, feedback, participation, effectiveness, and satisfaction.

The three remaining cases used pre-post design with control groups, a more powerful research method. Three circles were formed in the Circuit Board Assembly area, involving nine lines of repetitive, paced work. After six months, the three pilot lines which had circles improved productivity significantly over the six lines without circles. No exact figures were given in the study and no Job Reaction Survey administered.

A second case using a control group included two lines working on hybrid fuses. This was a new product where learning was taking place. One line implemented a circle; the other did not. Learning curves were compared to measure the effects of the QC program. Results showed the line with the circle learned how to build the fuses 6% faster than the control group, saving approximately $5 per unit over 3550 units of production. However, other factors (such as individual differences between the two lines) could have influenced the learning rates.

The final case using the pre-post design with control group was made in a machine shop which had out-of-date equipment, complex work, and a lot of downtime. Half of the 250 employees participated in 12 circles over a period of nine months. At the end of the study, the operators in circles improved machine utilization time by 9% over the control group.

While Donovan and Van Horn developed the Job Reaction Survey to measure job satisfaction and attitudes, they apparently only used it in their study of the Micro Electronics Lab. Results of the survey from other cases would have been useful in determining the effects of the QC program at Honeywell. Donovan and Van Horn stress that management involvement is important but no mention is made of the steering committee and facilitator's roles in the QC process. Overall the cases show a slight improvement in productivity over the control groups which may be attributed to the QC program.

Hunt (1981) Study at General Dynamics. A six-month study of six quality circles was conducted from January 1 through June 30, 1980, at General Dynamics Pomona Division. The two test facilities chosen were engaged in similar electronics assembly work but differed in size, location, and unionization. This was a field study where one variable, quality circles, was interjected into the regular working environment. Six circles were implemented: two in a plant with nearly 7,000 employees and a union, four in a plant with approximately 500 employees and no union. There were

no control groups against which the QC effects could be measured. It is difficult, therefore, to attribute the observed effects directly to QCs. Productivity in the circles was monitored in terms of reduced attrition, higher performance, improved quality, increased employee suggestions, and specific projects. The data were compared with data from the previous year for the same period. Several problems associated with the pre-post design may have affected the results of this study. Some changes occurred in circle composition due to transfers. One circle had three successive supervisors, two of which did not support the circle effort, resulting in poor performance by that circle. Installation of new equipment, methods, or facilities may have caused some improvement in performance, also. In some instances, improvement may have begun prior to implementing a circle due to a highly competent supervisor or staff.

Morale and motivation were measured according to several criteria:

1. Employee suggestions - As an indicator of job involvement and interest, it was felt that members would submit more ideas about work as they become more involved in decision-making. The submission rate for circle members rose substantially from 13.7% to 74.7% while the rate for other employees dropped slightly from 8.8% to 6.7%. The obvious reason for this may be simply that the groups met for an hour each week to discuss work-related problems.

2. Attrition and attendance - The job attrition rate was 8% for circle members compared to the factory-wide rate of 25%. Attendance showed no change.

3. Attitude survey and grievances - An attitude survey taken at the completion of the pilot phase revealed that the circle members felt the program made their jobs more enjoyable, improved their relationships with managers and co-workers, and improved the quality of work performance. Ninety-two percent of the members felt the program was a success and should be expanded. The recognition and attention given to circle members may have influenced their positive attitudes. Managers in circle areas were also asked for their assessment of the program. They felt progress had been made and that attitudes and productivity had improved. Managers also mentioned a newly acquired team spirit and quality consciousness among circle members. There was no change in number of grievances.

Performance was measured by specific projects' cost and time savings, operator efficiency, and quality.

1. Specific projects - The circles solved problems involving time savings or rework reduction which were readily quantifiable as well as those which improve the quality of work life and thus employee satisfaction. One circle rearranged a painting operation, saving an estimated 120 hours annually. The same circle recommended using solvent rather than hand sanding parts and eliminated about 147 hours labor time over two weeks. The value of each circle's projects was

measured in terms of cost and time savings. The estimated dollar savings per circle for the pilot phase was $3,500.

2. Operator Efficiency - The established measure of work cost center performance was defined as the ratio of standard hours earned to actual hours used for a specific task. Factors influencing the assessment of an individual's performance such as rework and scrap items made the measurement somewhat inaccurate. This was because rework items did not earn standard hours and scrap items were deducted. Also, data were only available at the work cost center level not at circle level. Despite these limitations, the average of improvement in operator efficiency was determined to be 1,227 hours saved. The accuracy of this figure is questionable.

3. Quality - Quality Assurance personnel and management made subjective statements as to a "general quality consciousness" shown by circle participants. Personal bias may have come into play in these statements. An objective measure of quality dealt with the defect rate. Two of the circles maintained their defect rate 20% and 50% better than the acceptable quality level for nine weeks.

It appears that these results may well have been due to the increased visibility of circle members and their regular hourly meetings to discuss problems. Use of a control group would probably have revealed more accurate effects of the QC program.

Novelli and Mohrman (1982) Study at Food Warehouse. Novelli and Mohrman conducted a detailed case analysis of a

circles program in one department of a large food distribution warehouse as part of management objectives of increasing employee involvement and productivity. The duration of the study was from five months prior to the beginning of the circles to ten months after their start. Before implementation, a general organizational survey showed that workers felt excluded from information and decision-making in their department. Thus they were quite responsive to management's suggestion for a worker problem-solving program.

In-house human resources staff members working with an external consultant designed the structure of the program and the supporting training program and materials. Their design did not always adhere to what we know traditionally about QCs. The initial four 10-person "problem-solving teams" were formed from volunteers. However, each team represented a cross-section of all warehouse activities rather than a single work section. In addition, the team leaders and co-leaders were workers; it is believed that a circle is more effective when a supervisor is also leader of the circle.

Meetings were scheduled for two hours every two weeks rather than one hour weekly. The facilitator from the human resources department attended these meetings to provide initial training and assistance. However, he should also have acted as liaison among the circles and management.

Each team was exposed to two days of training and various problem-solving techniques. They probably did not

receive sufficient training in the problem-solving process and none at all in management presentations.

A control group had originally been planned but external factors (physical expansion of the group's facilities) led to deteriorated work conditions which negated the group's usefulness as a control.

Due to the large number of employees wishing to take part, management decided to have periodic rotations when workers could choose to drop out and be replaced by volunteers. The first rotation occurred five months after the program began; several new leaders were selected and training given to new members. It would have been preferable for the workers to remain circle members over the entire period.

One occurrence which may have impacted the results of the study was a report prepared partway through implementation which included minor changes to the program.

Attitude survey data had been collected five months prior to the problem-solving activities, three months after the beginning of the program, and ten months after program initiation. There were no standards against which the QC effects could be measured since control groups were not used. Six objective measures including several productivity indicators, absenteeism, and accident rates were tracked at 4-week intervals beginning one year prior to program initiation. Interviews were held with workers, department managers, and key personnel to determine their reactions to the

program, its accomplishments, views of management support, and problem areas. So, in addition to the objective measures, qualitative data were also collected.

Results of the analysis revealed positive attitudes from those with extensive involvement in circle activities. Those with little or no involvement showed a decline in attitudes.

Unanticipated outcomes were a decline in motivation for all employees and a decline in trust and "belief in the human orientation of the company" for workers with some involvement with the QC program. Some members were concerned that the company was receiving benefits from their efforts but the workers were not being additionally compensated. Some members also felt that the teams did not address issues to benefit workers. Many were disillusioned by the slow pace of problem-solving.

Groups were often unwilling to accept responsibility for implementing ideas, preferring to let managers handle them. While activity level was quite high within the circles, many areas never reached the solution or implementation stages. The suggestion that was estimated to save the most money (a design for a strap to make handling of milk cases easier and reduce damage) was not adopted due to bureaucratic and supplier delays.

This failure to implement many circle ideas diminished the impact of the QC program on productivity and attitudes, leading managers to become less responsive to workers when

they saw no resulting increase in department performance. Before the end of the study, disillusionment of members and management's impatience with the lack of results nearly terminated circle activity.

At the end of the study, corporate personnel subjectively declared it a success since an annual monetary savings of $150,000 was projected. In addition, the program was expanded to other departments. However, management's endorsement of the QC program was probably influenced more by the enthusiastic and competent presentations of a few members than any rational analysis of the overall program.

The circles' decline was due mainly to workers' and management's failure to perform their proper roles in the QC process. In addition, there was no steering committee to provide overall guidance and goals to the circles.

Steel et al. (1982) Study at DOD Installation.

Steel, Lloyd, and Ovalle (1982) conducted research at a DOD organization to determine if quality circles exerted measurable changes in the attitudes of the work groups involved. In order to do this, a control group, as well as the quality circles group, was monitored to control as much as possible any effects not directly attributable to the quality circles program. A total of 383 individuals from 37 departments were involved in the study. One hundred thirty-three employees from 14 departments comprised the six quality circles initiated during the six-month longitudinal investigation.

Between the administration of a pretest and posttest the circle group members were given training in quality circle skills. The Organizational Assessment Package (OAP) was the instrument used to collect the pre and post data needed to assess attitudinal and cognitive changes in the participants. The OAP is a survey questionnaire consisting of 109 items which measure employee attitudes such as job satisfaction and organizational climate, beliefs concerning work group productivity and job characteristics, behavioral intentions regarding career plans, and demographic characteristics including sex, pay grade, and length of service. The non-demographic items in the OAP are keyed to 23 underlying psychological factors which were identified through factor analysis. Hendrix (1979) and Hendrix and Halverson (1979) provide further information on OAP developmental procedures, factor analytic results, and scale reliabilities. Responses to these items were arrayed on a seven-point Likert-type rating scale ranging from strongly disagree to strongly agree. The demographic factor responses were distributed on both ordinal and nominal scales. Premeasure differences existed between the treatment and control groups. Control group members appeared to be significantly older and better educated in addition to having a higher average pay grade and longer performance in their current position than their QC counterparts. Statistical adjustments were made for pre-existing differences on the pretest for selected variables

so that any posttest differences might be attributable to the QC treatment. Leveling of the sample appears to have occurred between the pretest and posttest since significant demographic differences between the control and treatment groups had disappeared. Results from the attitudinal measures tended to suggest that participation in the QC program had minimal impact on the responses of participants during the period of the study. Steel et al. (1982) caution that their results may have been confounded by the following methodological impairments:

1. The sample size was small and therefore some errors in statistical tests are to be expected.

2. All of the quality circles had not been active for six months to reach full maturity before the posttest was administered. This was due to staggered start-up dates.

3. Nonattitudinal measures of outcomes were not investigated. Behavioral and results criteria should also have been examined.

4. The samples were altered during the period of study possibly from employee turnover, new hirings, transfers, or reassignments. This would contribute to incomplete exposure to the quality circles treatment and lead to a lack of significant group differences.

5. The groups were not equivalent at the outset of the study and potential interaction with treatment may produce uninterpretable findings.

Two other conditions which should be noted are:

1. The level of analysis was at the department level rather than at the circle level (circles crossed formal departmental lines).

2. Individual data were not tracked over time.

Tortorich et al. (1981) Study at Martin-Marietta Aerospace. A study at Martin-Marietta Aerospace, Michoud Division, spanned the period January 1978 to January 1981 and entailed 16 six-month controlled before and after studies. During the second half of 1980, 31 quality circles consisting of a total of 276 members were formed. Twenty-seven of these circles were composed of 187 hourly production employees whereas the remaining circles were for salaried individuals. During the first half of 1981 the number of circles formed increased to a total of 40 and the number of employees involved grew to 366. Hourly paid employees who were members of 32 QCs then numbered 255. Results from the study are selected scales from the "Team Survey", an instrument developed by the researchers. The Team Survey measures 25 critical employee attitudes such as employee-supervisor relations, satisfaction with supervision, employee influence, internal motivation, job satisfaction, team climate, growth satisfaction, and job performance. However, no reliability information was provided for any of these variables. In the study, the following six kinds of organizational outcomes were tracked and monitored:

1. Product quality nonconformances
2. OSHA logged accidents (personnel injury)
3. Safety incidents (hardware damage)
4. Lost time hours
5. Grievances
6. Attitude related attrition.

Data extracted from records the organization keeps on these outcomes were analyzed according to the following breakdowns:

1. Hourly vs. salaried
2. Circle members vs. nonmembers
3. Circle members six months before joining vs. circle members six months after they joined.

Although there is no evidence, Tortorich et al. write that quality circle participation has a marked effect on employee attitudes toward themselves, their co-workers, supervision, and the opportunities for personal growth and development within the organization. Tortorich et al. note that a healthy organizational climate suggested by positive employee attitudes results in growth and success of the company in a competitive market. They further comment that satisfied employees are the best advertisement for the opportunities, products, jobs, and services offered by a company to the public. To monitor the effectiveness of the QCs, Tortorich et al. advised using the organization's normal data collection process rather than having the quality circle office involved in data collection activities which are expensive and

time consuming. They believe it is important to select and follow a specific time interval so that trends can be found when analyzing the measurement data. To measure the effectiveness of quality circles, Tortorich et al. suggest measuring the following three distinct and significant categories:

1. Program outcomes - direct measures of program growth and efficiency. These include:

a. The total number of supervisors successfully completing leadership training or the percent of the total supervisory population this number represents.

b. The total number of employees successfully completing circle training or the percent of the total employee population this represents.

c. The total number of circles formed and the average membership size.

d. The success rate as indicated by the total number of "active" circles compared to the total number formed or the total number of "active" members with respect to the total number trained.

e. The voluntary rate showing the percent of employees joining circles after they receive a presentation about the program.

f. The total number of management presentations, the percent of approved proposals and/or the yearly rate of presentations per circle.

g. Types of problems worked divided into categories such as quality improvement, cost savings, safety, training, etc.

h. The total estimated savings resulting from specific circle proposals or the estimated ratio of cost savings resulting from circle proposals to program expenditures.

2. Personal outcomes - measures the effect of quality circles on the affective reactions of employees toward their job situation. These can be assessed through questionnaires which measure employee reactions to the QC process, their jobs, themselves, their co-workers, their supervision, their management, and the organization.

3. Organization outcomes - measures the impact of QCs on variables which greatly impact the overall success of the organization in a competitive market. These variables include: production rates, defect rates, scrap rates, attrition rates, lost time, grievance rates, and accident rates. These measures will provide valuable information to both management and quality circle administrators.

The Tortorich et al. study would have been more rigorous if they had used control groups. They did develop good process measures to show whether or not QCs can work in an organization. Rather than evaluating the direct effects of quality circles, Tortorich et al. monitored overall organizational outcomes. These outcomes may or may not be directly attributable to quality circles.

Summary

Quality circle evaluation attempts are subject to many shortcomings and barriers to reliable results. The structure and training plan of the QC program serves as the framework for the entire program. However, the QC program analyzed by Novelli and Mohrman (1982) was not structured according to traditional QC theory. There was no steering committee to provide overall guidance, circle leaders were workers rather than supervisors, and circles were a cross-section rather than a single work center. In addition, there was insufficient training provided to circle members, which omitted skills in management presentations. The need for training in QC skills was identified also in the study by Steel et al. (1982). Whitehead and Blair (1982) write that if organizations "cut corners" on training, the QC failure rate will be high.

Too small a sample size may lessen the strength of any conclusions to be drawn from a study. Steel et al. (1982) identified this as a factor to consider when assessing a QC program. Two of the cases studied by Donovan and Van Horn (1980) dealt with small sample sizes (one had only one circle, another three).

Some weaknesses associated with the pre-post research design, which most of these studies used, include changes in circle membership due to transfers, additions of new equipment, or changes in facilities. Hunt (1981) as well as Steel et al. (1982) mentioned the possibility of

altered samples due to employee turnover, new hirings, and reassignments. Altered samples may lead to incomplete exposure to QC training and increased similarity between circle and control groups.

Steel et al. (1982) cite insufficient time for circles to reach maturity as one reason for confounded study results. Even though the research effort spanned approximately six months, some of the QCs formed during that time did not have sufficient time to develop. Three of the six had only been in existence for less than one month when the posttest was administered.

The use of control groups for comparison is important to an evaluation of a QC program. However, no control groups were used by Hunt (1981), Novelli and Mohrman (1982), or Donovan and Van Horn (1980) in two cases. Steel et al. (1982) write that control groups and QC groups must be monitored in order to control as much as possible any effects not directly attributable to QCs. When setting up control and QC groups, differences in age, education, grade level, and tenure must be controlled as much as possible (Steel et al., 1982). An essential equivalence between the two groups must be present to assure a more accurate assessment of a QC program.

The measurement of cost savings (program outcomes) and worker attitudes (personal outcomes) are mentioned by the research teams of Tortorich et al. (1981) and Donovan and Van Horn (1980) as data necessary for a "good" evaluation of

(e.g., number of defects, grievances, absenteeism, accidents, attrition) should be considered when assessing the worthwhileness of quality circles implementation.

The method used in data collection may disguise the effects portrayed in the analysis of a quality circle effort. Neither Hunt (1981) nor Steel et al. (1982) collected data at the circle level. Hunt's data for operator efficiency were collected at the work cost center level whereas Steel et al. aggregated results by department since the QCs cut across formal organizational boundaries. When combining data in this manner the failure of one circle may water down any positive effects which may have resulted from other quality circles as well as vice versa."

RESEARCH OBJECTIVE

The objective of this research is to analyze changes in perceptions and attitudes often associated with Quality Circles. Specifically, this thesis will evaluate the effect of quality circles on cohesiveness, communication, task characteristics, job satisfaction, organizational commitment, participation, perceived work-group performance, and perception of the supervisor's performance. A pattern of positive changes on these variables may indicate that quality circles exert meaningful effects on key variables of interest to managers. Novelli and Mohrman (1982) write that QCs impact on cohesiveness and commitment because of the high

degree of involvement required by the problem-solving process. Donovan and Van Horn (1980) believe that QCs affect certain job and climate variables. Communication, participation, and task characteristics are variables that have been found to be related to satisfaction and the work group's perception of performance (Donovan & Van Horn, 1980).

Cohesiveness

Cohesiveness is the strength of member attraction to the group (Milton, 1981). When the forces acting on group members to remain in the group are greater than the forces acting on them to leave, the group is said to be "cohesive". Successful performance of group tasks can increase cohesiveness (Albanese, 1981). Alternatively, cohesiveness can have a positive effect on performance if the reasons for the cohesiveness are consistent with group tasks and goals. Szilagyi and Wallace (1980) write that the highest levels of group performance are found in highly cohesive groups who have established high performance norms (behavior guidelines). Whitehead and Blair (1982) write that the QC process encourages cohesion. Group cohesion is enhanced through team building exercises, small group size, and homogeneous membership. Team building, a component of the QC process, increases members' propensity to work with and be supportive of other group members (Blair & Hurwitz, 1981). In the Novelli and Mohrman (1982) study, groups which were highly

involved in QC activities improved in group cohesion. Homans and Lott believe that a link exists between cohesiveness and communication (Applewhite, 1965).

Communication

There is no generally accepted definition of communication but some scholars equate it with "interaction" (Albanese, 1981). In Blake and Mouton's (1968) cross-cultural study of managers, they found that 74% of the managers named communication as the single greatest barrier to corporate excellence. The importance of communication is derived from the contribution it makes to managerial and organizational performance. Additionally it is the means by which individuals receive the meaning of information that influences their life in the organization (Albanese, 1981). Quality circles are thought to impact on communication and group involvement (Novelli & Mohrman, 1981). In the QC process, open communication is required in order to obtain information necessary to solve problems (Whitehead & Blair, 1982). Circles communicate their findings to management who in turn provide feedback to the group. Pascale and Athos (1981) write that communication is a "two-way street". To work effectively, it must flow both ways between subordinate and manager. Integrating QCs into an existing organizational structure should minimize the feeling that managers are being left out of decision making and improve communication (Whitehead & Blair, 1982). Open communication leads to a more supportive organizational

environment which enhances work performance and reduces conflict (Whitehead & Blair, 1982). In fact, the first apparent changes in an organization due to a QC program will probably be in worker attitudes and improved communications (Mento, 1982). Gryna (1981) reports that discussions held with managers of 11 organizations repeatedly centered on "improved communication" as a benefit of the QC program.

Task Characteristics

Wood et al. (1982) and Mento (1982) write that QCs appear to enrich a participant's job thereby increasing its motivational potential. Indicators of five task characteristics - skill variety, task identity, task significance, autonomy, job feedback - are readily identifiable through a job enrichment model such as the model developed by Hackman and Oldham. Whitehead and Blair (1982) have also written about the potential QCs have for satisfying employees' expectation of autonomy. Two job and climate variables, task significance and feedback, are identified by Donovan and Van Horn (1980) as having been consistently related to high productivity and satisfaction. Because of this, items which would yield scores on these two variables were included in the Job Reaction Survey, a QC research tool, developed by Donovan and Van Horn.

Job Satisfaction

Job satisfaction is an attitude that may be directed toward an overall job or toward particular components of a

job (Albanese, 1981). Locke (1969) writes that satisfaction or dissatisfaction concerning the job is a function of the perceived relationship between what one wants from his job and what one perceives it as offering or entailing. There are differing views concerning the relationship between satisfaction and performance. Two of the propositions are causal in nature. One states the performance level of a person results from his satisfaction and the other says the reverse occurs. However, there is growing support for still another view that says a third (or more) variable(s) may co-vary with satisfaction and performance. Several studies suggest "rewards" as being one such variable. Locke and Schweiger state that job satisfaction may and does affect certain factors (absenteeism and turnover, for example) related to the long-term profitability of business firms, and this is a major reason why business managers are (or should be) concerned with job satisfaction (Albanese, 1981).

Goodman (1980) has written of the proliferation of projects during the past decade which attempt to improve organizational effectiveness. He believes one of the major goals to these change programs is job satisfaction. Research conducted by Tortorich et al. (1981) and Steel et al. (1982) measure job satisfaction when assessing the effect of quality circles. The Job Reaction Survey (Donovan and Van Horn, 1980) also measures overall satisfaction.

Organizational Commitment

Richard Steers (1977) defines organizational commitment as the relative strength of an individual's identification with and involvement in a particular organization. He also says it can be characterized by at least the three following factors:

1. A strong belief in and acceptance of the organization's goals and values.

2. A willingness to exert considerable effort on behalf of the organization.

3. A strong desire to maintain membership in the organization.

Total internal commitment to goals combined with the opportunity and skill to support that commitment with behavior would tend to have a positive impact on performance (Albanese, 1981).

One of the fundamental premises of QCs is to involve workers in decision-making. Blair and Hurwitz (1981) have written that increasing an individual's participation in decision-making can lead to a higher degree of commitment to the work and organization. This increase in employee commitment can then result in an improved organizational effectiveness. According to Novelli and Mohrman (1982), QCs might be expected to impact favorably on productivity and attitudes if the program increases worker commitment and changes the relationship to his job or company so as to influence him to exert a greater effort.

Participation

Chris Argyris (1971) writes that people want to be involved in and to participate in meaningful activities. He also refers to research done by K. Levin and his students which shows that participation may lead to more productivity, greater commitment, and greater personal satisfaction. Their research went further to show that participation is worthwhile and useful because people have important contributions to make. Levin specifically points to directive, authoritarian type leaders as inhibitors of participation and Argyris claims this type of leadership may cause people to become frustrated in organizations. This tends to lead to absenteeism, turnover, and indifference (Argyris, 1971). Participation is a means of bringing workers into management (Milton, 1981). Participation in decision-making has been shown to increase both productivity and human satisfaction (Cummings & Molloy, 1977). The QC process itself requires a great deal of participation by all members (Whitehead & Blair, 1982). Quality circles represent a "major reorientation" for the organization toward a more participative style. The concept allows workers to participate in problem-solving, decision-making, and implementation of solutions (Whitehead & Blair, 1982). Because the workers are ultimately responsible for the success or failure of circle ideas, they are more apt to participate in their implementation. Novelli and Mohrman (1982) concluded in their study that those

workers who participated fully in the QC process improved their attitudes significantly compared to workers with less involvement.

Perceptions

Perception is the process by which individuals attach meaning to their experience (Albanese, 1981). Albanese (1981) believes that abilities and skills, role perception, attitudes, values, and motivation contribute to the job performance of an individual employee. One of the most psychologically relevant reference groups for most people is the work group, including peers and the supervisor (Luthans, 1972). Myers has written that attitudes relevant to job performance are determined, in part, by the group affiliations of employees and managers (Albanese, 1981). Suppressed feelings adversely affect problem-solving, personal growth, and job satisfaction (Luthans, 1972). An employee's behavior is the result of his/her response to the stimulus of a supervisor's conduct and the employee's own nature. The behavior will lead to some kind of consequences which are called accomplishments. Job performance is one such accomplishment (Luthans, 1972). From extensive studies of organizational effectiveness, Mott (1972) has identified key items to be used in assessing an employee's perception of others in his/her work group. These include the quantity and quality of output, efficient use of resources, anticipation of

problems and then preventing or minimizing their effect, and how well they handle high priority (e.g., "crash projects) work.

Perceptions of workers and management influence the success or failure of a QC program. If QCs are perceived by middle management as a threat to their authority, low morale or resistance could result (Blair et al., 1982). Perceptions of circle members and managers led to difficulties in the QC program studied by Novelli and Mohrman (1982). Workers' and middle management's perceptions of the lack of progress made by circles nearly caused the program to become dormant. In contrast, senior management's perceptions were positive due to isolated reports of dollar savings and enthusiastic presentations by a few circle members (Novelli & Mohrman, 1982).

HYPOTHESES

Previously in this chapter we have identified variables which are believed to be affected by participation in a QC program. This paper examines causal relationships between quality circles and certain job attitudes and perceptions. Below, these relationships are stated as formal hypotheses for testing.

Hypothesis 1

Involvement in a quality circles program leads to increased group cohesiveness among organizational workers.

Hypothesis 2

Involvement in a quality circles program leads to improved communication among workers and between workers and management.

Hypothesis 3

Involvement in a quality circles program leads to increases in workers' skill variety, task identity, task significance, autonomy, and job feedback.

Hypothesis 4

Involvement in a quality circles program leads to increased job satisfaction.

Hypothesis 5

Involvement in a quality circles program leads to increased commitment toward the organization by workers.

Hypothesis 6

Involvement in a quality circles program leads to increased participation in the organization and the problem-solving process.

Hypothesis 7

Involvement in a quality circles program leads to improved perceptions of work group performance and perceptions of supervisors' performance.

CHAPTER 3

METHODOLOGY

Introduction

The purpose of this chapter is to describe the procedures used to collect, measure, and analyze the attitudinal and perceptual variables addressed in this study. The data collection procedures, measurement instrument, and data analysis methods will be discussed.

Data Collection Procedures

The data used in this longitudinal study were obtained from two Department of Defense installations. In January 1982, initial data were gathered with an instrument administered by an Air Force Institute of Technology (AFIT) researcher. Participation was voluntary and anonymity assured. Group sizes at the testing site varied from 20 to 60 civilian and military personnel per administration. Specific shops within the participating work centers were denoted as control and experimental groups. Following this pretest, quality circles were implemented. A year later, a posttest was administered to provide additional data for comparison.

Measures

The survey questionnaire included 119 items measuring attitudinal variables and 14 items assessing personal demographic information. Only a portion of the variables measured by this survey were used in this study; therefore, only those variables will be discussed. Responses to all the attitudinal variables were arrayed on either a 5 or 7-point Likert-type scale. With this rating scale, responses are on a continuum such as "very dissatisfied" (1) to "very satisfied" (5) or "strongly disagree" (1) to "strongly agree" (7).

Appendix A contains the questionnaire items used in this study. Negatively stated items were reverse scored during data analysis procedures. The symbol (R) follows the reverse scored items in Appendix A. Reverse scoring was used in an attempt to reduce response bias.

Demographic characteristics. Demographic characteristics studied were: age, education level, months in present organization, months in present position, months in present occupation, and pay grade. This information was collected to determine if there were significant demographic differences between QC and control groups. In addition, comparisons of pretest and posttest means within QC and control groups were carried out to uncover any changes in QC composition over time.

Job satisfaction. Twenty-one survey items were used to measure the employee's degree of satisfaction with

various aspects of his/her job. The instrument, the short-form of the Minnesota Satisfaction Questionnaire, was developed by Weiss, Dawis, England, and Lofquist while they were conducting studies on the general problem of adjustment to work (Weiss et al., 1967). The questionnaire has been administered to people employed in diverse occupations and is extensively used by researchers (Gillet & Schwab, 1975). The median reliability coefficients for this instrument were: .86 for intrinsic satisfaction, .80 for extrinsic satisfaction, and .90 for general satisfaction (Weiss et al., 1967). Various facets of the job environment such as ability utilization, achievement, co-workers, recognition, supervision-human relations, and working conditions are used to measure the employee's degree of satisfaction with these aspects of his/her job. For further study the responses were categorized into intrinsic satisfaction, extrinsic satisfaction, and general satisfaction.

Task characteristics. The Job Diagnostic Survey (JDS), developed by Hackman and Oldham, was the instrument used to measure a worker's perception of the degree to which five core job dimensions characterize the job (Albanese, 1981). These dimensions are as follows:

1. Skill variety - Degree to which a job requires a variety of different activities.

2. Task identity - Degree to which a job requires completing a "whole" and identifiable piece of work.

3. Task significance - Degree to which a job has a substantial impact on the lives of other people.

4. Autonomy - Degree to which the job provides substantial freedom and discretion to the individual in scheduling the work and in determining the procedures to be used in carrying it out.

5. Job feedback - Degree to which carrying out the work activities required by the job provides the individual with direct and clear information about the effectiveness of his/her performance.

This instrument consists of two sections: seven items relating to the degree of involvement in various work activities and fourteen items which are statements describing a job. The responses in section 1 range from very little to very much and section 2 responses range from very inaccurate to very accurate.

Table 1 shows the internal consistency reliabilities found by Hackman and Oldham (1975).

Table 1
Reliabilities of the Job Diagnostic Survey

Skill variety	.71
Task identity	.59
Task significance	.66
Autonomy	.66
Job feedback	
From the job itself	.71
From supervisors or co-workers	.78

Work group attitudes. Four variables on the survey instrument were classified as work group attitudes: organizational commitment, cohesiveness, communication, and participation.

The instrument used to measure organizational commitment was the 15-item questionnaire developed by Porter, Steers, Mowday, and Boulian known as the Organizational Commitment Questionnaire. This questionnaire was specifically designed to measure the degree to which subjects feel committed to the employing organization. Included are items pertaining to the respondent's perceptions concerning his/her loyalty toward the organization, his/her willingness to exert a great deal of effort to achieve organizational goals, and his/her acceptance of the organization's values (Porter et al., 1974). The responses range from strongly disagree to strongly agree. The internal consistency reliability of the instrument was found to range from .82 to .93 (Porter et al., 1974).

Since there were no existing scales to measure the remaining three constructs (cohesiveness, communication, and participation), questions based on a careful analysis of relevant literature were developed by AFIT researchers. Responses to these items range from strongly disagree to strongly agree. The three items measuring cohesiveness relate to teamwork spirit among co-workers, personal interest in one another, and whether the employee would stay

in the same work group if given the chance to do the same kind of work for the same pay in another work group. Items measuring communication assess whether the respondent is given all the necessary information to do his/her job effectively, if his/her work group is usually aware of important events and situations, and if his/her supervisor asks members of the work group for ideas on task improvements. Measures of participation are derived from two items. The respondent is asked if the people (within his/her work group) most affected by decisions frequently participate in making the decisions and if there is a great deal of opportunity to be involved in resolving problems which affect the group.

Performance perceptions. Measures of the employee's perception of both his/her work group's performance and his/her supervisor's performance were included on the survey questionnaire.

Five items relating to productivity, adaptability, and flexibility were used to measure work group performance. These items, which were identified by Mott (1972), included: the quantity and quality of output of work group members, the efficient use of resources (e.g., money, materiel, personnel), anticipation of problems and solving them satisfactorily, and coping when high priority work arises (e.g., "crash projects", sudden schedule changes).

Perceptions of the supervisor's performance were measured by asking the respondent if the supervisor represents the group at all times, if he/she performs well

under pressure, and if he/she is a good planner. Responses to these eight items range from strongly disagree to strongly agree.

Data Analyses

A series of statistical procedures were conducted to address the specific objectives of this research. Specifically, internal consistency reliability, bivariate correlation analysis, and multiple linear regression were used to evaluate the data. Only a brief discussion of each method will be included in this study. Detailed explanations of these procedures may be found in most statistics books (McClave & Benson, 1982).

Internal consistency reliability. There can be no unequivocal scientific results without reliability. Reliability is the accuracy or precision of a measuring instrument (Kerlinger, 1973). For a test to be internally consistent, the test items must be homogeneous. That is, they should be written unambiguously so that individuals will not interpret them differently. Other methods to improve reliability include the use of standard and clear instructions, and tests administered under standard, well-controlled, and similar conditions. The use of a large number of test items is preferred since the probability of chance errors being balanced is greater than with fewer test items (Kerlinger, 1973).

Systematic and/or random error may affect test scores (Kerlinger, 1973). Systematic errors are due to natural or man-made influences that cause test scores to be biased in one direction more than another.

Random errors are due to unknown, ordinary, chance factors. Random errors may be due to the test subject's fatigue, fluctuations of mood, or lapse of memory. Test scores may vary from one measurement to another as an individual's attention and effort change. Over longer periods of time, learning and personal changes may cause test scores to differ. Since there are a number of factors which may influence the results of a questionnaire, some measurement of consistency must be checked to indicate the instrument's trustworthiness (Cronbach, 1970).

To estimate the accuracy of the measuring instrument, Cronbach's coefficient alpha was used. Cronbach's alpha was calculated for each element of our research to indicate how well the scores obtained represent true scores (Cronbach, 1970).

Bivariate correlation analysis. Bivariate correlation provides a single number which summarizes the strength of the linear relationship between two variables and also measures the "goodness of fit" of the data to the regression line (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975). The Pearson product-moment coefficient of correlation (r) was used in this research effort to indicate the degree to which change in one variable is related to change in another. If

the value of r approaches +1.0 or -1.0, it may be assumed that there is a strong linear relationship between the two variables in question. If the r value is near zero, it may be assumed that there is no linear relationship. In addition to summarizing the strength of the relationship between one pair of variables, the correlation coefficient can also be used to compare the strength of the relationship between one pair of variables and another pair.

Pearson's coefficient also can be used to indicate the "goodness of fit" of the regression line. Values of +1.0 or -1.0 for r indicate a perfect fit of the data to the regression line. A negative r denotes an inverse relationship such that as X becomes larger, Y tends to become smaller. A positive r means that X and Y increase or decrease together. When the regression equation poorly fits the data, r will be near zero.

A primary reason for calculating the correlation matrix on all variables in the study was to identify the presence of multicollinearity or redundancy between variables. Bivariate correlations were tested at the .05 significance level.

Multiple linear regression. Multiple linear regression is a general statistical technique used to analyze the relationships between a dependent variable (criterion) and a set of independent (predictor) variables (Nie et al., 1975). As a descriptive tool, multiple linear regression may be used to control for confounding factors to evaluate the

contribution of a particular variable. Regression may also be used to find the best prediction equation and evaluate its prediction accuracy.

One outcome of regression analysis is the set of regression coefficients (beta weights) which are the sample estimates for the population parameters. The value of each beta determines the relative effect of its associated independent variable (given that the other independent variables are held constant) on the dependent variable.

Another outcome of regression analysis is the multiple coefficient of determination ($\underline{R}^2$). The coefficient of determination provides an overall measure of how well the model fits the data. It represents the proportion of the variation in the dependent variable that can be explained by the independent variables (McClavy & Benson, 1982).

The hierarchical method of regression was used in which the variables were added to the equation in a particular order. Posttest scores on the survey questionnaire were used as criteria. Pretest results were entered on the first step of the regression analysis to reduce pretest differences between the groups on the specific variable being examined. A dummy variable representing QCs or control groups was entered next in the analysis. This was done so that the increment of $\underline{R}^2$ at each step could be interpreted as the variation in the dependent variable attributable to the quality circles intervention. The hierarchical method allows the user to specify the order of inclusion of

variables into the model. This is useful when there is a definite causal ordering among the independent variables or when the user would like to check multicollinearity among the independent variables (Nie et al., 1975). A significance level of .05 was used.

Student's t-test. To evaluate differences between effects, group means were compared using Student's t-test. The t-test was used to determine whether or not the difference between two sample means was significant. That is, whether or not a difference in sample means is indicative of a true difference between the two populations. Comparisons made were:

1. posttest QC group and posttest control group; and,
2. pretest QC group and posttest QC group.

CHAPTER 4

RESULTS

This chapter presents results of the statistical analyses of the data.

Demographic Characteristics

Comparison of means (t-tests) between the QC groups and control groups on selected demographic variables are shown in Table 2. These means were computed using the data from both the DOD installations under study. For a detailed listing of demographic categories, refer to Appendix B.

Several significant pretest differences were detected between the QC and control groups. Control group members were apparently better educated than QC members. However, QC members had performed longer in both their present job and occupation. Prior to the posttest, leveling of the sample appears to have taken place on these measures. However, control group members are apparently significantly older than QC members. This suggests that different individuals were involved in the pre and posttests.

Mean difference tests were also conducted on data from each of the installations. Table 3 shows the t-tests for selected demographic characteristics at Installation 1.

Table 2

Quality Circles and Control Group Demographic Characteristics (DOD Installations 1 and 2)

	Pretest			Posttest		
	QC	Control		QC	Control	
Variable	$\bar{X}$	$\bar{X}$	t	$\bar{X}$	$\bar{X}$	t
Age	2.73	2.86	1.15	2.93	3.38	2.27**
Education Level	2.72	3.07	2.97*	2.98	3.34	1.83
Months in Organization	4.37	4.55	0.90	5.11	5.61	1.79
Months in Present Position	4.02	3.56	-2.55**	4.39	4.30	-0.02
Months in Present Occupation	5.32	4.52	-4.18*	5.36	5.47	0.39
Grade Level	2.71	2.46	-1.97	2.89	2.82	-0.34

Note: means are for 6 Quality Circles and 11 control groups at two DOD installations.
N = 17
* $p < .01$
** $p < .05$

Table 3

Quality Circles and Control Group Demographic Characteristics (DOD Installation 1)

	Pretest			Posttest		
	QC	Control		QC	Control	
Variable	$\bar{X}$	$\bar{X}$	t	$\bar{X}$	$\bar{X}$	t
Age	2.59	2.08	-3.37*	2.77	2.67	-0.47
Education Level	2.59	2.32	-2.37**	2.91	2.80	-0.49
Months in Organization	4.49	3.79	-2.52**	4.74	4.49	-0.66
Months in Present Position	4.06	3.49	-2.28**	4.42	3.75	-1.89
Months in Present Occupation	5.22	3.92	-4.84*	5.07	4.90	-0.42
Grade Level	2.63	2.03	-3.24*	2.81	2.66	-0.61

Note: PRETEST Range of N: 188-196
POSTTEST Range of N: 90-94
* $p < .01$
** $p < .05$

Significant pretest differences were detected on all of the variables. However, these differences seem to have leveled off prior to the posttest, indicating a change in sample composition.

The t-tests for all individuals at the second installation are shown in Table 4. Pretest differences were found in three of the variables. Control group members were apparently better educated and had been in the present organization longer than QC members. However, QC members appeared to have worked longer in their present occupation. All these differences disappeared by the time of the posttest. Apparently, the composition of the QC and control groups changed over time removing the initial demographic differences.

Internal Consistency Reliabilities

Estimates of internal consistency reliability (coefficient alpha) were computed for each of the 15 factors studied. Table 5 presents these reliabilities.

The overall reliability coefficients ranged from a low of .51 for the task identity in the JDS at Installation 1 to a high of .90 for organizational commitment at Installation 2. An examination of the reliabilities also revealed 13 of the factors at Installation 2 had higher alphas than those computed for Installation 1. Only the values for cohesiveness and perceptions of supervisor's performance were higher at Installation 1. The variable showing the greatest

Table 4

Quality Circles and Control Group Demographic Characteristics (DOD Installation 2)

	Pretest			Posttest		
	QC	Control		QC	Control	
Variable	$\bar{X}$	$\bar{X}$	t	$\bar{X}$	$\bar{X}$	t
Age	3.04	3.22	1.00	3.33	3.90	1.65
Education Level	3.02	3.40	2.01*	3.17	3.74	1.60
Months in Organization	4.11	4.88	2.50*	6.00	6.41	1.78
Months in Present Position	3.91	3.59	-1.06	4.33	4.84	1.08
Months in Present Occupation	5.55	4.78	-2.33*	6.06	5.88	-0.44
Grade Level	2.91	2.64	-1.53	3.15	2.95	-0.53

Note: PRETEST Range of N: 206-227
POSTTEST Range of N: 74-87
* $p < .05$

Table 5

Internal Consistency Reliabilities (Coefficient Alphas) of Attitudinal Variables for Survey Administrations at Two Department of Defense Installations

	N of Items	DOD Installation 1		DOD Installation 2	
		N	Alpha	N	Alpha
Extrinsic Satisfaction	6	291	.72	279	.79
Intrinsic Satisfaction	12	285	.83	272	.85
General Satisfaction	20	284	.56	271	.63
Perception of Work Group Performance	5	296	.81	279	.85
Job Autonomy (JDS)	4	298	.59	282	.65
Task Identity (JDS)	3	299	.51	283	.63
Skill Variety (JDS)	3	298	.58	281	.78
Task Significance (JDS)	3	299	.57	279	.71
Extrinsic Feedback (JDS)	3	299	.75	281	.82
Intrinsic Feedback (JDS)	3	299	.56	282	.71
Participation	2	297	.62	282	.63
Cohesiveness	3	296	.72	282	.69
Perception of Supervisor Performance	3	294	.84	283	.82
Communication	3	296	.64	284	.68
Organizational Commitment	15	283	.88	278	.90

variation (.20) in reliability between the two installations was the JDS skill variety measure. Since the survey instrument was administered to all participants with the same instructions and under similar conditions, the variation might be due to the dissimilarity in the nature of the jobs at the two installations. The jobs at Installation 2 might require a greater variety of different activities than those at Installation 1. At both installations the factor with the lowest reliability was found to be JDS task identity, and organizational commitment consistently displayed the highest reliability.

Pearson Correlations

Pearson correlation coefficients (r) were computed among all 15 variables on both the pretest and posttest data. Table 6 presents the zero-order correlations for both the pretest and posttest data. Values above the main diagonal were derived from posttest data and those below, from the pretest.

The highest correlation (r = .94) from both the pretest and posttest variable combinations was between intrinsic and general satisfaction. Using the pretest data, the lowest correlation (r = .07) was between extrinsic satisfaction and task significance whereas computations using posttest data revealed $r < .01$ for three pairs of factors: extrinsic satisfaction and task identity, general satisfaction and task significance, and cohesiveness and task significance.

Table 6

Intercorrelation Matrix of Attitudinal Variables for Pretest and Posttest Survey Administrations at Two Department of Defense Installations

Attitudinal Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Extrinsic Satisfaction		.62	.84	.27	.21	.00	.18	-.02	.33	.14	.33	.46	.59	.56	.28
2. Intrinsic Satisfaction	.67		.94	.32	.40	.20	.36	.02	.24	.20	.33	.42	.34	.46	.32
3. General Satisfaction	.87	.94	POSTTEST / PRETEST	.34	.37	.14	.32	.00	.31	.19	.36	.50	.49	.57	.34
4. Perception of Work Group Performance	.39	.35	.42		.15	.08	.17	.05	.18	.27	.29	.43	.31	.40	.20
5. Job Autonomy	.24	.35	.33	.14		.28	.30	.26	.07	.19	.23	.22	.14	.17	.18
6. Task Identity	.15	.26	.24	.15	.23		.25	.20	.01	.20	.01	.12	.06	.20	.25
7. Skill Variety	.20	.34	.31	.24	.27	.33		.15	.09	.27	.22	.22	.15	.22	.37
8. Task Significance	.07	.11	.10	.26	.27	.20	.22		.10	.17	.17	.00	.08	.09	.03
9. Job Feedback (Extrinsic)	.42	.35	.41	.27	.19	.27	.26	.17		.12	.16	.17	.25	.26	.22
10. Job Feedback (Intrinsic)	.23	.29	.29	.18	.21	.27	.27	.25	.20		.19	.09	.05	.22	.14
11. Participation	.44	.41	.46	.26	.22	.20	.26	.10	.21	.21		.26	.25	.25	.14
12. Cohesiveness	.41	.41	.48	.59	.23	.23	.28	.20	.30	.20	.35		.48	.57	.23
13. Perception of Supervisor Performance	.58	.39	.51	.43	.10	.20	.19	.18	.32	.22	.38	.45		.54	.23
14. Communication	.57	.45	.55	.46	.16	.24	.26	.17	.33	.19	.34	.52	.63		.38
15. Organizational Commitment	.32	.38	.39	.38	.21	.20	.23	.15	.26	.25	.27	.38	.33	.43	

Note: PRETEST Range of N: 409–425; a value of .10 is significant at $P < .05$ for $N \geq 400$.
POSTTEST Range of N: 179–186; a value of .15 is significant at $P < .05$ for $N \geq 175$.

For the pretest data, the two strongest correlations (r = .42 and r = .41) involving JDS elements were between extrinsic job feedback and job satisfaction (extrinsic and general) and for the posttest, the strongest correlations (r = .40 and r = .37) were between job autonomy and job satisfaction (intrinsic and general). The intercorrelations between the JDS elements were generally found to be lower than those reported by Hackman and Oldham (1975). The strongest correlation (r = .51) found by Hackman and Oldham (1975) was between job autonomy and skill variety. This correlation was also one of the stronger found for the pretest and posttest data.

Generally the highest correlations found among the other variables for both the pretest and posttest data were intercorrelations involving job satisfaction. These correlations were between r = .50 and r = .59. One notable exception is a correlation of r = .63 between communication and perception of supervisor performance.

Tests of Quality Circle Effects

Tables 7 through 9 display pretest and posttest means for each of the fifteen attitudinal variables under study at the two DOD installations. These means were summed for each variable according to whether the individual was a QC or control group member. Then, t-tests were conducted using the aggregate means to test for significant differences between QC and control group responses.

The comparison of pretest means for Installation 1 (Table 7) reveals significant differences in extrinsic, intrinsic, and general satisfaction, and organizational commitment. On the posttest, three variable means were higher for control groups than for QCs. These were: perceptions of work group performance, task significance, and perception of supervisor's performance.

Table 8 displays data from matched individuals at Installation 2. No significant differences existed between QC and control groups on the pretest. Significant differences between QCs and control groups were detected on the posttest in two variables: task identity and task significance. In both cases, the control group means were higher than the QCs.

When work center means for the two installations are combined (refer to Table 9), a pretest difference exists only in intrinsic feedback. Significant posttest differences were revealed in three variables. Control group means for perceptions of work group performance, task significance, and perceptions of supervisor performance were higher than for QCs. These were the same three variables found to be significant at Installation 1.

To further evaluate the differences in attitudinal measures within the QC groups, t-tests were carried out to compare pretest and posttest means. No significant changes were found. To summarize the results, any differences

Table 7

Quality Circles and Control Group Means for Attitudinal Factors
(DOD Installation 1)

	Pretest					Posttest				
	QC		Control			QC		Control		
Factor	$\bar{X}$	SD	$\bar{X}$	SD	t	$\bar{X}$	SD	$\bar{X}$	SD	t
Extrinsic Satisfaction	17.23	4.57	15.83	4.85	-2.05*	18.16	4.58	18.52	5.14	0.35
Intrinsic Satisfaction	43.17	7.98	39.98	7.61	-2.83**	44.58	8.03	43.10	8.71	-0.85
General Satisfaction	67.44	12.10	62.36	12.33	-2.87**	69.70	12.39	68.55	12.86	-0.44
Perceptions of Work Group Performance	24.02	7.10	24.48	5.86	0.49	25.23	5.02	27.45	5.04	2.13*
Job Autonomy	17.11	3.01	16.32	3.21	-1.75	17.98	2.73	18.00	2.93	0.04
Task Identity	12.99	2.84	13.14	2.84	0.34	13.65	2.32	13.57	1.93	-0.19
Skill Variety	12.77	3.05	12.79	2.59	0.03	13.16	2.50	13.41	2.80	0.46
Task Significance	13.82	2.65	14.01	2.63	0.50	13.53	2.69	14.58	2.14	2.05*
Extrinsic Feedback	11.28	2.53	10.54	3.07	-1.77	11.88	3.10	12.41	2.47	0.98
Intrinsic Feedback	13.32	2.49	12.79	2.37	-1.51	13.73	1.78	13.45	2.04	-0.70
Participation	7.59	3.33	7.20	3.22	-0.83	7.22	3.28	8.43	2.64	1.92
Cohesiveness	13.52	4.60	13.36	4.09	-0.25	12.84	4.05	14.18	4.22	1.57
Perceptions of Supervisor Performance	13.22	5.09	12.88	5.04	-0.34	12.93	4.53	14.80	4.13	2.03*
Communication	12.94	4.13	12.33	3.72	-1.07	13.37	3.90	14.37	3.73	1.26
Organizational Commitment	60.92	9.36	57.99	9.17	-2.14	61.38	11.87	60.46	8.64	-0.42

Note: Means are for individuals in 2 Quality Circles and 2 control groups. PRETEST Range of N: 188-196; POSTTEST Range of N: 90-94

* $p < .05$

** $p < .01$

Table 8

Quality Circles and Control Group Means for Attitudinal Factors
(Matched Individuals at DOD Installation 2)

	Pretest					Posttest				
	QC		Control			QC		Control		
Factor	$\bar{X}$	SD	$\bar{X}$	SD	t	$\bar{X}$	SD	$\bar{X}$	SD	t
Extrinsic Satisfaction	17.58	5.23	18.36	5.26	0.92	19.00	5.70	20.24	5.42	0.85
Intrinsic Satisfaction	44.21	8.01	44.76	8.54	0.41	46.26	11.45	48.92	6.98	0.96
General Satisfaction	68.31	12.98	70.01	14.00	0.79	71.58	17.26	76.96	12.58	1.27
Perceptions of Work Group Performance	25.83	5.29	24.98	7.19	-0.92	28.11	6.16	29.52	5.12	0.92
Job Autonomy	17.11	3.98	18.09	3.10	1.56	17.89	2.85	19.37	2.95	2.00
Task Identity	13.34	2.99	13.02	2.70	-0.68	12.95	1.81	13.97	1.93	2.16*
Skill Variety	13.48	2.71	12.88	2.59	-1.38	13.21	1.90	13.53	2.16	0.64
Task Significance	14.20	1.82	13.98	2.34	-0.68	13.68	1.46	14.49	1.82	2.04*
Extrinsic Feedback	11.37	2.92	11.57	2.79	0.43	12.26	2.13	11.89	3.03	-0.62
Intrinsic Feedback	13.50	2.22	12.76	2.75	-1.94	13.21	2.25	13.82	2.60	1.02
Participation	7.75	3.77	7.71	3.25	-0.06	8.11	3.25	8.36	3.77	0.29
Cohesiveness	13.02	4.29	13.70	4.54	0.96	14.05	4.43	14.74	4.60	0.60
Perceptions of Supervisor Performance	13.50	4.83	13.54	5.00	0.06	14.79	5.26	15.83	4.34	0.08
Communication	13.83	3.95	13.74	4.41	-0.14	15.47	4.56	15.56	4.07	0.07
Organizational Commitment	63.69	7.19	62.59	9.24	-0.88	63.63	8.08	64.86	8.29	0.50

Note: Means are for matched individuals in 4 Quality Circles and 9 control groups.
N = 100
* $p \leq .05$

Table 9

Quality Circles and Control Group Means for Attitudinal Factors
(DOD Installations 1 and 2)

	Pretest					Posttest				
	QC		Control			QC		Control		
Factor	$\bar{X}$	SD	$\bar{X}$	SD	t	$\bar{X}$	SD	$\bar{X}$	SD	t
Extrinsic Satisfaction	17.34	4.76	17.57	5.26	0.48	18.42	4.92	19.53	5.35	1.41
Intrinsic Satisfaction	42.47	7.98	43.26	8.54	-0.26	45.10	9.15	46.58	8.20	1.08
General Satisfaction	67.70	12.33	67.60	13.93	-0.07	70.27	13.94	73.55	13.31	1.53
Perceptions of Work Group Performance	24.55	6.65	24.82	6.80	-0.40	26.11	5.51	28.66	5.17	3.02*
Job Autonomy	17.11	3.30	17.55	3.23	1.34	17.95	2.74	18.81	3.00	1.94
Task Identity	13.09	2.88	13.05	2.78	-0.14	13.44	2.19	13.80	1.94	1.12
Skill Variety	12.98	2.96	12.85	2.59	-0.46	13.18	2.32	13.48	2.43	0.84
Task Significance	13.93	2.44	13.99	2.43	0.26	13.58	2.37	14.53	1.95	2.72*
Extrinsic Feedback	11.30	2.63	11.26	2.91	-0.17	12.00	2.83	12.10	2.81	0.24
Intrinsic Feedback	13.37	2.41	12.77	2.63	-2.42*	13.57	1.93	13.67	2.39	0.31
Participation	7.64	3.16	7.56	3.24	-0.25	7.50	3.27	8.39	3.34	1.71
Cohesiveness	13.37	4.50	13.60	4.41	0.51	13.21	4.17	14.51	4.44	1.96
Perceptions of Supervisor Performance	13.23	5.00	13.34	5.01	0.21	13.50	4.80	15.41	4.27	2.65*
Communication	13.20	4.09	13.31	4.25	0.26	14.02	4.19	15.07	3.96	1.64
Organizational Commitment	61.76	8.83	61.19	9.44	-0.62	62.08	10.81	63.03	8.68	0.59

Notes: Means are for 6 Quality Circles and 11 Control Groups at two DOD installations.
PRETEST Range of N: 315-428
POSTTEST Range of N: 140-186
* p < .05

between the QCs and control groups are probably due to the changing composition of the sample over time.

Regression Analyses

Two separate regression analyses were performed on the data to statistically control for pretest differences. Regression analyses were conducted using group means for the six QCs and eleven control groups (Table 10). In addition, regression was carried out using data which included only those individuals who participated in both pretest and posttest surveys at Installation 2 (Table 11). The posttest score for each attitudinal variable was the dependent variable. The corresponding pretest score was the first variable entered into the regression equation. Then, the experimental treatment variable was entered at step 2. Each hypothesis is restated in this section followed by a statistical analysis of the regression results.

Hypothesis 1. Involvement in a quality circles program leads to increased group cohesiveness among organizational workers.

Regression analyses on group means were carried out with cohesiveness as the criterion. The pretest scores for cohesiveness were entered first. When the dummy variable depicting QC or control group membership was entered at step 2, the R^2 increased by 0.204 (R^2 = 0.244). However, the F statistic (F = 2.257) was not significant. The regression using matched individuals' data revealed an R^2 of 0.050 at step 2, after pretest scores for cohesiveness had been

Table 10

Regression Analysis of Quality Circles Effects for Data Aggregated by Work Center

Variable	R^2		ΔR^2		Beta		F	
	Pretest	Treatment	Pretest	Treatment	Pretest	Treatment	Pretest	Treatment
Cohesiveness	0.040	0.244	0.040	0.204	0.1479	-0.4545	0.624	2.257
Communication	0.128	0.269	0.128	0.141	0.3083	-0.3793	2.200	2.580
Skill Variety	0.183	0.307	0.183	0.124	-0.3089	-0.3721	3.363	3.107
Task Identity	0.036	0.118	0.036	0.082	0.2073	-0.2872	0.558	0.937
Task Significance	0.002	0.000	0.002	0.000	-0.0398	0.000	0.024	0.000
Autonomy	0.207	0.384	0.207	0.177	0.4876	-0.4217	3.918	4.361
Extrinsic Feedback	0.034	0.103	0.034	0.069	-0.1988	-0.2631	0.526	0.803
Intrinsic Feedback	0.016	0.060	0.016	0.044	-0.0099	-0.2408	0.242	0.450
Extrinsic Satisfaction	0.002	0.195	0.002	0.193	-0.0238	-0.4448	0.025	1.699
Intrinsic Satisfaction	0.000	0.000	0.000	0.000	-0.0119	0.0000	0.002	0.000
General Satisfaction	0.000	0.000	0.000	0.000	-0.0095	0.0000	0.001	0.000
Organizational Commitment	0.016	0.169	0.160	0.009	0.4136	-0.0939	2.864	1.423
Participation	0.012	0.025	0.012	0.013	0.1163	-0.1165	0.181	0.185
Perceptions of Work Group Performance	0.081	0.204	0.081	0.123	0.2495	-0.3526	1.328	1.798
Perceptions of Supervisor Performance	0.070	0.284	0.070	0.214	0.1893	-0.4681	1.135	2.772

Note: * $p < .05$
$N = 17$

Table 11

Regression Analysis of Quality Circles Effects for Data Aggregated at Individual Level

Variable	R^2		ΔR^2		Beta		F	
	Pretest	Treatment	Pretest	Treatment	Pretest	Treatment	Pretest	Treatment
Cohesiveness	0.049	0.050	0.049	0.001	0.2161	-0.0272	5.037	2.531
Communication	0.090	0.000	0.090	0.000	0.2994	0.0000	9.552	0.000
Skill Variety	0.095	0.097	0.095	0.002	0.3084	-0.0394	10.200	5.139*
Task Identity	0.031	0.074	0.031	0.043	0.1844	-0.2089	3.058	3.819
Task Significance	0.010	0.038	0.010	0.028	0.1085	-0.1674	0.971	1.889
Autonomy	0.077	0.096	0.077	0.019	0.2496	-0.1411	8.150	5.147*
Extrinsic Feedback	0.030	0.031	0.030	0.001	0.1719	0.0345	2.873	1.532
Intrinsic Feedback	0.178	0.192	0.178	0.014	0.4370	-0.1160	21.066	11.380*
Extrinsic Satisfaction	0.126	0.130	0.126	0.004	0.3513	-0.0670	13.793	7.104*
Intrinsic Satisfaction	0.102	0.110	0.102	0.008	0.3085	-0.0901	10.866	5.857*
General Satisfaction	0.083	0.098	0.083	0.015	0.2765	-0.1201	8.641	5.086*
Organizational Commitment	0.127	0.131	0.127	0.004	0.3597	-0.0591	13.868	7.077*
Participation	0.036	0.041	0.036	0.005	0.1941	-0.0694	3.604	2.032
Perceptions of Work Group Performance	0.153	0.165	0.153	0.012	0.3900	-0.1074	16.852	9.086*
Perceptions of Supervisor Performance	0.046	0.053	0.046	0.007	0.2093	-0.0870	4.590	2.668

Note: * $p < .05$
$N = 100$

entered at step 1. The F statistic was not significant. The findings from both regression analyses seem to indicate that no difference occurred in cohesiveness as a function of QC involvement.

Hypothesis 2. Involvement in a quality circles program leads to improved communication among workers and between workers and management.

Regression analyses on group means were conducted using communication posttest scores as the dependent variable. Pretest scores were entered at step 1. When the experimental treatment variable was entered at step 2, the R^2 rose to 0.269, a change of 0.141. The F statistic was not significant ($F = 2.580$), however. Regression analyses were done using matched individual data. Pretest scores were entered at step 1. The addition of the dummy variable (QC or control group) at step 2 did not contribute significantly to explaining any criterion variance. No R^2 or F statistic was computed due to insufficient F-level tolerance requirement. The analyses revealed no evidence for improved communication as a function of QC involvement.

Hypothesis 3. Involvement in a quality circles program leads to increases in workers' skill variety, task identity, task significance, autonomy, and job feedback.

Regression analyses on group means were conducted using each of the elements of the JDS as the criterion. Pretest scores were entered at step 1. After entering the experimental treatment variable at step 2, the highest R^2, 0.384, occurred in the variable autonomy, an increase of

0.177. Its F statistic proved to be significant at the .05 level of significance, indicating that either QC or control group posttest scores were significant. Referring to the table of group means revealed that the control group mean for autonomy was higher than for QCs. This would indicate that QC involvement did not contribute to an increase in autonomy. The regression on matched individuals' data was carried out on each specific JDS element. Pretest scores were entered at step 1. At step 2, the highest R^2 was computed for intrinsic feedback (R^2 = 0.192), the lowest for extrinsic feedback (R^2 = 0.031). Changes in R^2 ranged from 0.001 to 0.043. The F statistics of three of the six elements studied were significant at the .05 level of significance. However, comparing the control groups to QC means revealed that in all cases control group means were higher than QC means. These findings do not support the contention that QC involvement leads to increases in the JDS elements under study.

Hypothesis 4. Involvement in a quality circles program leads to increased job satisfaction.

Regression analyses were conducted using group means on three elements of job satisfaction: extrinsic, intrinsic, and general satisfaction. After the pretest scores were entered at step 1, the experimental treatment variable was entered. The R^2 for extrinsic satisfaction was 0.195, an increase of 0.193. The F statistic was not significant. Neither the R^2 nor F statistic was computed for intrinsic

or general satisfaction at step 2 since the F-level for these two factors was insufficient for computations. Apparently, there was no change in satisfaction as a function of QC involvement. Regression analyses using matched individuals' data were conducted on the three elements of job satisfaction. After the pretest scores were entered, the dummy variable (QC or control group) was entered at step 2. Changes in R^2 ranged from 0.004 to 0.015. F statistics for the three satisfaction elements were significant at the .05 level of significance. However, a comparison of QC and group means revealed that in all three cases, it was the control group mean that was higher than the QC. It can therefore be concluded that the increases in satisfaction cannot be attributed to QC involvement.

Hypothesis 5. Involvement in a quality circles program leads to increased commitment toward the organization by workers.

Regression analyses using group means were conducted using organizational commitment posttest scores as the criterion. Pretest scores were entered at step 1. After the dummy variable depicting QC or control group membership was entered at step 2, the R^2 was 0.169. The F statistic was not significant. Individual regression analyses were also conducted on organizational commitment. After entering the experimental treatment variable at step 2, the R^2 equaled 0.131, an increase of 0.004. The computed F statistic was significant at the .05 level of significance. Comparison of

QC to control group means revealed that the control group mean for commitment was actually greater than the QC mean. Therefore, these regression analyses provided no evidence that organizational commitment is a function of QC involvement.

Hypothesis 6. Involvement in a quality circles program leads to increased participation in the organization and the problem-solving process.

Regression on group means was carried out using participation posttest scores as the dependent variable. Pretest scores were entered at step 1. After entering the dummy variable (QC or control group), the R^2 was found to be 0.025, an increase of 0.013. The computed F statistic was not significant. The regression analyses using individual data revealed that participation increases as a function of QC involvement.

Hypothesis 7. Involvement in a quality circles program leads to improved perceptions of work group performance and perceptions of supervisors' performance.

Regression analyses were conducted using group means for the two perception variables. Pretest scores were entered at step 1 for each variable. The experimental treatment variable entered at step 2 produced an R^2 of 0.204 for perception of work group performance and an R^2 of 0.284 for perception of supervisor performance. Neither F statistic was found to be significant, however. Regression analyses using matched individuals data were performed on the two perception variables. At step 2, the R^2 for perceptions of

work group performance was 0.165, an increase of 0.012; the R^2 for perceptions of supervisor performance was 0.053, a change of 0.007. The F statistic for perceptions of supervisor performance was not significant; the F statistic for perceptions of work group performance was significant at the .05 level of significance. However, the comparison of QC and control group means showed that the control group mean for perceptions of work group performance was higher than the QC mean. The findings of these analyses provide no evidence that perceptions of work group and supervisor performance increase as a function of QC involvement.

Summary

Demographic differences between the groups and subsequent leveling over time indicate that sample composition changed between the pretest and posttest. Computed reliability coefficients for each of the attitudinal variables covered by the survey instrument revealed task identity to have the lowest reliability; organizational commitment consistently displayed the highest reliability.

In most cases, control group means for attitudinal variables were higher than for QCs. Comparison of group means and regression analyses conducted at both the work center and individual level provide no evidence that QC involvement leads to improved attitudes.

CHAPTER 5

DISCUSSION AND RECOMMENDATIONS

In Chapter 4, we presented the results of the statistical analyses. These results, as well as limitations of the study and our recommendations for future QC programs, will be discussed in this chapter.

Discussion

The purpose of this study was to evaluate the effects of two QC programs on certain attitudinal variables suggested by the literature as being related to QC program effects. Analyses were conducted for the combined data from both DOD facilities at the group level (both QCs and control groups). In addition, at one installation, available data from individuals' matched pretest and posttest results were analyzed to determine if attitudinal changes had occurred in individuals involved over time.

Evaluating the QC programs at the group level, it can be concluded that the QC intervention at the two DOD installations had no impact on the attitudinal measures. The more powerful test of matched cases revealed no impact on QC members' attitudes as a result of QC involvement. In every case when significant differences were found between QC treatment and control conditions, the mean for the

control group was higher. In addition, the amount of variance in the dependent variable explained by the QC intervention (ΔR^2) was small in all cases. For these reasons, we must conclude that the QC program had little impact on QC members' attitudes.

Similar results have been found in other studies. Novelli and Mohrman (1982) also concluded that the QC program they researched had little influence on the measured attitudes. Only in the case of individuals with extensive involvement in the QC program were attitudes positively influenced. In our research effort, however, even though the matched individuals at Installation 2 had extensive involvement in QCs, their attitudes were not positively affected. Steel et al. (1982) also concluded that the QC program in their study had little impact on attitudinal factors but also cautioned that methodological difficulties may preclude generalizability of their results. In this case, the QC programs apparently had no positive effect on circle members' attitudes. Managers contemplating setting up a QC program in their own organizations should consider the results found here as well as other research efforts, keeping in mind that rigorous data does not currently exist for any "successful" programs.

Study Limitations

Neither the facilitator at Installation 1 nor Installation 2 considered the QC program under his guidance

successful. The facilitator at Installation 1 (1983) specifically referred to the short time the QCs were in existence. Following the curtailment of the initial QC groups, another attempt was made to form QCs in two other squadrons. This time the training pattern was changed from the ten 1-hour per week sessions to a more concentrated pattern of two half-day sessions. Again, these circles "lost momentum" and disbanded after only a few meetings (Facilitator at DOD Installation 1, 1983). Apparently, a combination of member disinterest and lack of management support caused the circles to dissolve.

At Installation 2 excessive workload was cited as a reason for dwindling QC interest (Facilitator at DOD Installation 2, 1983). Manpower staffing which was below normal, perhaps as much as 25%, resulted in 12-hour rather than the normal 8-hour shifts. The additional work was believed to prohibit personnel in many of the areas from even attending the 1-hour per week QC meetings.

Goodman (1980) has written that most Quality of Work Life (QWL) projects (through modifications in decision-making practices, communication networks, training methods, and reward systems) lead to improved economic indicators (e.g., productivity), psychological indicators (e.g., improved worker satisfaction and the ability to grow and develop new skills), and labor-management indicators. Even though Goodman (1980) concedes that it is difficult to

accurately summarize the total QWL picture in the United States he believes the following to be true:

1. Most QWL projects seem to result in increases in job satisfaction, feelings of personal growth, job involvement, and organizational commitment.

2. Absenteeism, turnover, and tardiness are strongly and positively affected in most QWL projects.

3. With respect to productivity, it increases in half of the QWL experiments, whereas it remains the same in the other half.

4. Most QWL projects create more skilled and flexible work forces.

One of Goodman's basic findings was that over time many of the QWL projects were no longer operational. Some reasons cited were:

1. Sponsorship: When the sponsor left the organization or changed the focus of his commitment the project deteriorated.

2. Feedback: Current information on the results of QWL actions were not being provided.

3. Commitment: In many of the QWL efforts, there was commitment at the top but not throughout the other levels of management and membership.

A telephone interview with the facilitator at Installation 1 (1983) identified experimental mortality and the general lack of commitment by management and QC members

as possible reasons for the failure of the program. The facilitator at Installation 2 (1983) also cited obtaining (and keeping) top management and middle management acceptance as problems. Additionally, he believed that there was a highly skeptical attitude toward the QC concept initially. Managers at DOD Installation 2 had been operating under an excessive workload. At the same time, the facility was undergoing new construction. The resultant pressure and lack of time caused middle managers to attend to "more pressing priorities" than QCs (Facilitator at DOD Installation 2, 1983).

This study was one of the few attempts at QC program evaluation in which both pretest and posttest data were collected to evaluate the effects of QCs. Either the case is that QCs really do not affect these attitudes or methodological impairments may have confounded study results. Even though pretest data were collected, the number of posttest individual data matches was limited. This led to a small sample size used in this study particularly at the group level of analysis; therefore, some incidence of Type II errors is to be expected. In addition, experimental mortality altered the character of samples in the treatment groups. Fluctuations in the demographic characteristics over time indicate that there may have been changes in the composition of the groups during the study period. Employee turnover, new hirings, transfers, or reassignments could have caused these fluctuations to occur.

This study measured only attitudinal and perceptual variables. To more accurately evaluate the effectiveness of QCs, future studies should also examine performance and "hard" measures. Tortorich et al. (1981) recommended two categories of direct program outcomes and organizational outcomes in addition to personal attitudinal outcomes. These categories were discussed more fully in Chapter 2. Donovan and Van Horn (1980) also recommended measurement on multiple levels. Productivity and quality measures, as well as personal reaction measures, should be included in an evaluation of a QC program. Often productivity and quality measures are not collected because they are difficult to obtain at the group level (which is the relevant level of study) rather than organizational level.

Recommendations

Our first recommendation is that additional research be done on existing and future QC programs in the military. Currently, there are not enough practical examples of research on QC programs in the military for managers to build on and draw from when developing their own QC programs. Further measurement of QC programs is critical for organization decision makers for several reasons. Data from well-designed evaluation studies could be used by managers who are deciding whether or not to adopt a QC program. Too often managers adopt new management techniques unquestioningly and then become disillusioned with results. A collection of

QC program evaluation data could help managers discontinue the "adoption-disappointment-discontinuation" cycle described by Wood et al. (1982) by providing them with lessons learned, expected effects of QCs, and a guide for implementation strategies. In this way, managers may learn to have more realistic expectations.

This particular study could have been improved by acquiring data other than attitudinal measures. No data were collected on suggestions made or implemented by the QCs or any associated dollar or time savings. Also, interviews with QC members would have provided additional qualitative data.

Several areas were identified as possible hindrances to the success of the QC programs at the two DOD facilities under study. From our extensive review of the literature on QCs, analyses of research efforts, and our own analyses of two QC programs, we have specific recommendations for managers considering a QC intervention in an organization. We consider these to be cardinal factors which are commonly disregarded.

Before implementing a QC program, the organizational climate must be assessed. Some organizational climates are more conducive than others to a participative style of management. An organization which involves shift work and differing types of professionals (such as a hospital) may not be the best atmosphere in which to implement a QC program.

Nevertheless, managers must assess the appropriateness of the technique and readiness of personnel to accept innovations before initiating any such programs. A thorough organization diagnosis is a key component rarely done before QCs are implemented.

It cannot be overemphasized that top and middle managers must be supportive and committed to the program. Numerous studies have cited the lack of management support as a major cause of failure. Whitehead and Blair (1982) write that one of the most frequently cited problems associated with QCs is the lack of management support. Novelli and Mohrman (1982) and Metz (1981) also found lack of middle manager support to be a major cause of program failure. Without management backing, QC members may tend to perceive their efforts to be futile and a waste of time. Managers at all levels must support the QC program to insure its success. This support must be obtained during the first phase of the QC program. To obtain middle management support and commitment, good implementation planning must be accomplished to insure managers understand QCs and do not feel threatened. Thorough training is essential to avoid unrealistic expectations (Metz, 1981). Goodman (1980) writes that the first phase of any QWL program needs to be a commitment-development phase where key managers pledge their support. Goodman believes that if this support is not present, the program should be terminated.

Another recommendation is that a QC program be initiated slowly and in as stable an environment as possible, a process which may take years. Change should begin in only a few work centers to give members and personnel in other areas a chance to learn about the process and see it in action. The best plan is to build an evolutionary system which will slowly change the organizational climate from traditional to participative management. This type of evolutionary implementation may not always be possible. Stable leadership is preferable so that principal managers may be in their positions over predictable periods of time. This stability would avoid the effect of changing supervisors during a QC effort. Slow change and stable leadership are factors to consider when planning a QC intervention. These ideas suggest that the military inherently is not an ideal setting for QCs.

Adherence to the principles of QCs is vital to their success. The literature on QCs outlines key requirements for training and structure (Gryna, 1981; Mento, 1982; Whitehead & Blair, 1982). If these principles are followed, the program will have a better chance to succeed.

A final recommendation to those contemplating a QC intervention is to allow the QCs time to produce results. Changes do not occur overnight and possibly not until after a year's time because QCs require a change in the style of management and decision-making.

In summary, in order for a QC program to be successful, the organizational climate must be conducive to the participative decision-making management style. A careful organizational diagnosis is necessary to determine if QCs are the most appropriate intervention. Managers must be completely supportive and committed to the program. Any major change in management style should begin slowly and in a stable leadership environment. To facilitate success, the principles of QCs should be followed closely. The QC program may have a better chance of success if implemented by knowledgeable and competent Organizational Development specialists. Finally, managers should be realistic in their expectations and allow time for the QC program to produce positive changes in the organization.

APPENDICES

APPENDIX A

STUDY MEASURES

JOB SATISFACTION

The individual's satisfaction in his/her present job. The following rating scale was used:

1 = very dissatisfied

2 = dissatisfied

3 = can't decide

4 = satisfied

5 = very satisfied

Extrinsic Satisfaction

1. The way my boss handles his men.

2. The competence of my supervisor when he makes a decision.

3. The way company policies are put into practice.

4. My pay and the amount of work I do.

5. The chances for advancement on the job.

6. The praise I get for doing a good job.

Intrinsic Satisfaction

1. Being able to keep busy all the time.

2. The chance to work alone on the job.

3. The chance to do different things from time to time.

4. The chance to be "somebody" in the community.

5. Being able to do things that didn't go against my conscience.

6. The way my job provides for steady employment.

7. The chance to do things for other people.

8. The chance to tell people what to do.

9. The chance to do something that makes use of my abilities.

10. The freedom to use my own judgment.

11. The chance to try my own methods of doing the job.

12. The feeling of accomplishment I got from the job.

General Satisfaction

Includes the items in Extrinsic and Intrinsic Satisfaction plus the following.

1. The working conditions.

2. The way my co-workers got along with one another.

3. Enjoying the work itself.

PERCEPTION OF WORK GROUP PERFORMANCE

The individual's view of the performance of his/her work group. The following rating scale was used:

1 = strongly disagree

2 = moderately disagree

3 = slightly disagree

4 = neither agree or disagree

5 = slightly agree

6 = moderately agree

7 = strongly agree

1. The quantity of output of your work group members is very high.

2. The quality of output of your work group members is very high.

3. Your work group members always get maximum output from the available resources (e.g., money, materiel, personnel).

4. Your work group members do an excellent job anticipating problems that may come up and either preventing them from occurring or minimizing their effects.

5. When high priority work arises (e.g., "crash projects", and sudden schedule changes) your work group members do an excellent job in handling and adapting to these situations.

JOB CHARACTERISTICS

The individual's description of his/her job. The following rating scales were used:

A.

1-----2-----3-----4-----5-----6-----7
Very little — Moderate — Very much

B.

1	2	3	4	5	6	7
Very inaccurate	Mostly Inaccurate	Slightly Inaccurate	Uncertain	Slightly Accurate	Mostly Accurate	Very Accurate

The following two statements use Scale B.

2. The supervisors and co-workers on this job almost never give me any "feedback" about how well I am doing in my work. (R)

3. Supervisors often let me know how well they think I am performing the job.

Intrinsic Feedback

The following question uses Scale A.

1. To what extent does doing the job itself provide you with information about your work performance? That is, does the actual work itself provide clues about how well you are doing - aside from any "feedback" co-workers or supervisors may provide?

The following two statements use Scale B.

2. Just doing the work required by the job provides many chances for me to figure out how well I am doing.

3. The job itself provides very few clues about whether or not I am performing well. (R)

PARTICIPATION

The individual's feelings about his/her work group, the demands of his/her job, and the supervision he/she receives. The following rating scale was used:

1 = strongly disagree

2 = moderately disagree

3 = slightly disagree

4 = neither agree nor disagree

5 = slightly agree

6 = moderately agree

7 = strongly agree.

1. Within my work group the people most affected by decisions frequently participate in making the decisions.

2. In my work group there is a great deal of opportunity to be involved in resolving problems which affect the group.

COHESIVENESS

The individual's feelings about his/her work group, the demands of his/her job, and the supervision he/she receives. The following rating scale was used:

1 = strongly disagree

2 = moderately disagree

3 = slightly disagree

4 = neither agree nor disagree

5 = slightly agree

6 = moderately agree

7 = strongly agree

1. There is a high spirit of teamwork among my coworkers.

2. Members of my work group take a personal interest in one another.

3. If I had a chance to do the same kind of work for the same pay in another work group, I would still stay here in this work group.

PERCEPTION OF SUPERVISOR PERFORMANCE

The individual's feelings about his/her work group, the demands of his/her job, and the supervision he/she receives. The following rating scale was used:

1 = strongly disagree
2 = moderately disagree
3 = slightly disagree
4 = neither agree nor disagree
5 = slightly agree
6 = moderately agree
7 = strongly agree

1. My supervisor represents the group at all times.
2. My supervisor performs well under pressure.
3. My supervisor is a good planner.

COMMUNICATION

The individual's feelings about his/her work group, the demands of his/her job, and the supervision he/she receives. The following rating scale was used:

1 = strongly disagree
2 = moderately disagree
3 = slightly disagree

4 = neither agree nor disagree

5 = slightly agree

6 = moderately agree

7 = strongly agree

1. My organization provides all the necessary information for me to do my job effectively.

2. My work group is usually aware of important events and situations.

3. My supervisor asks members of my work group for our ideas on task improvements.

ORGANIZATIONAL COMMITMENT

The individual's feelings about the organization for which he/she works. The following rating scale was used:

1 = strongly disagree

2 = moderately disagree

3 = slightly disagree

4 = neither agree nor disagree

5 = slightly agree

6 = moderately agree

7 = strongly agree

1. I am willing to put in a great deal of effort beyond that normally expected in order to help this organization be successful.

2. I talk up this organization to my friends as a great organization to work for.

3. I feel very little loyalty to this organization. (R)

4. I would accept almost any type job assignment in order to keep working this organization.

5. I find that my values and the organization's values are very similar.

6. I am proud to tell others that I am part of this organization.

7. I could just as well be working for a different organization as long as the type of work was similar. (R)

8. This organization really inspires the very best in me in the way of job performance.

9. It would take very little change in my present circumstances to cause me to leave this organization. (R)

10. I was extremely glad that I chose this organization to work for, over others I was considering at the time I joined.

11. There's not too much to be gained by sticking with this organization indefinitely. (R)

12. Often, I find it difficult to agree with this organization's policies on important matters relating to its employees. (R)

13. I really care about the fate of this organization.

14. For me this is the best of all possible organizations for which to work.

15. Deciding to work for this organization was a definite mistake on my part. (R)

Job Autonomy

The following two questions use Scale A.

1. To what extent does your job require you to work closely with other people (either "clients", or people in related jobs in your own organization)?

2. How much autonomy is there in your job? That is, to what extent does your job permit you to decide on your own how to go about doing the work?

The following two statements use Scale B,

3. The job denies me any chance to use my personal initiative or judgment in carrying out the work. (R)

4. The job gives me considerable opportunity for independence and freedom in how I do the work.

Task Identity

The following question uses Scale A.

1. To what extent does your job involve doing a "whole" and identifiable piece of work? That is, is the job a complete piece of work that has an obvious beginning and end? Or is it only a small part of the overall piece of work, which is finished by other people or by automatic machines?

The following two statements use Scale B.

2. The job is arranged so that I do not have the chance to do an entire piece of work from beginning to end. (R)

3. The job provides me the chance to completely finish the pieces of work I begin.

Skill Variety

The following question uses Scale A.

1. How much variety is there in your job? That is, to what extent does the job require you to do many different things at work, using a variety of your skills and talents?

The following two statements use Scale B.

2. The job requires me to use a number of complex or high-level skills.

3. The job is quite simple and repetitive. (R)

Task Significance

The following question uses Scale A.

1. In general, how significant or important is your job? That is, are the results of your work likely to significantly affect the lives or well-being of other people?

The following two statements use Scale B.

2. This job is one where a lot of other people can be affected by how well the work gets done.

3. The job itself is not very significant or important in the broader scheme of things. (R)

Extrinsic Feedback

The following question uses Scale A.

1. To what extent do managers or co-workers let you know how well you are doing on your job?

APPENDIX B

INTERPRETATION OF DEMOGRAPHIC VALUES

Age:

1. Less than 20
2. 20 to 25
3. 26 to 30
4. 31 to 40
5. 41 to 50
6. 51 to 60
7. More than 60

Highest educational level obtained:

1. Non high school graduate
2. High school graduate or GED
3. Some college work
4. Associate degree or LPN
5. Bachelor's degree or RN
6. Some graduate work
7. Master's degree
8. Doctoral degree

Months in Organization:

1. More than 1 month
2. More than 1 month, less than 6 months
3. More than 6 months, less than 12 months
4. More than 12 months, less than 18 months
5. More than 18 months, less than 24 months
6. More than 24 months, less than 36 months
7. More than 36 months

Months in present position:

1. Less than 1 month
2. More than 1 month, less than 6 months
3. More than 6 months, less than 12 months
4. More than 12 months, less than 18 months
5. More than 18 months, less than 24 months
6. More than 24 months, less than 36 months
7. More than 36 months

Months in present occupation:

1. Less than 1 month
2. More than 1 month, less than 6 months
3. More than 6 months, less than 12 months
4. Between 1 and 2 years
5. Between 2 and 3 years
6. Between 3 and 4 years
7. More than 4 years

Grade level:

1. 1-2
2. 3-4
3. 5-6
4. 7-8
5. 9-10
6. 11-12
7. 13-14
8. Senior Executive Service

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